NEW ZEALAND JOURNAL OF Agriculture

AUGUST - 1957

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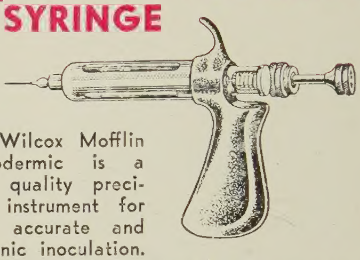

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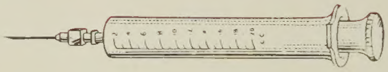

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Volume 95
Number 2
15 August
1957
(Established 1910)

NEW ZEALAND JOURNAL OF Agriculture

Published by
Direction
of
Rt. Hon. K. J. Holyoake,
Minister of Agriculture

This Month's Cover

The contribution of the sheep industry to the value of New Zealand's export produce has been steadily growing in recent years and the trend toward more intensive farming methods, the greater use of fertilisers, and improvement of pastures are reflected in the greatly increased numbers of breeding ewes and the numbers of lambs tailed annually. In the last 30 years breeding ewes have increased from about 13,500,000 to over 22,500,000 and the number of lambs has almost doubled. This month's cover, reproduced from a colour photograph by National Publicity Studios, depicts a September scene on "Lauderdale", the property of Mr. D. J. Law, Kohuratahi, in the Taranaki Province.

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SUBSCRIPTION RATES

The "Journal" is issued monthly. The subscription within New Zealand is 10s. a year; the overseas subscription is 13s. (sterling). The "Journal" may be ordered from any bookseller or newsagent or direct from any office of the Department of Agriculture. Individual copies are available from Publications Section, P.O. Box 2298, Wellington, at 1s. a copy, post free.

Subscribers' inquiries (preferably accompanied by the address cut from a recent "Journal" wrapper) should be sent to the nearest office of the Department of Agriculture.

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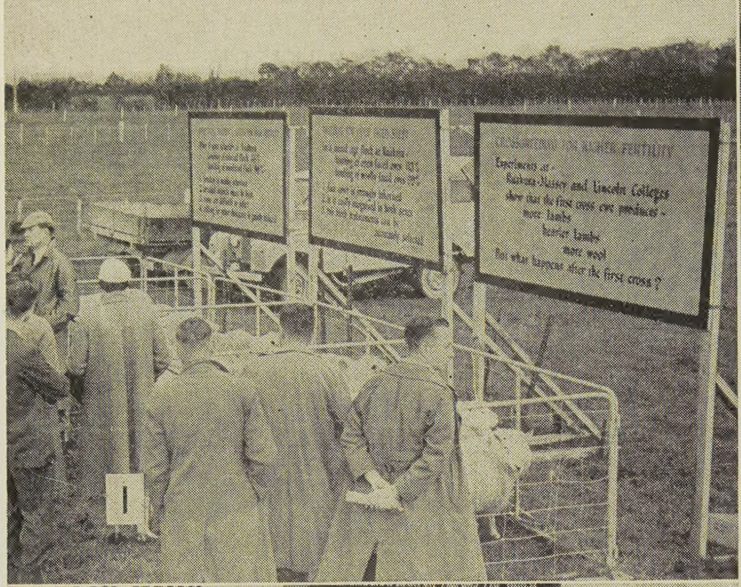
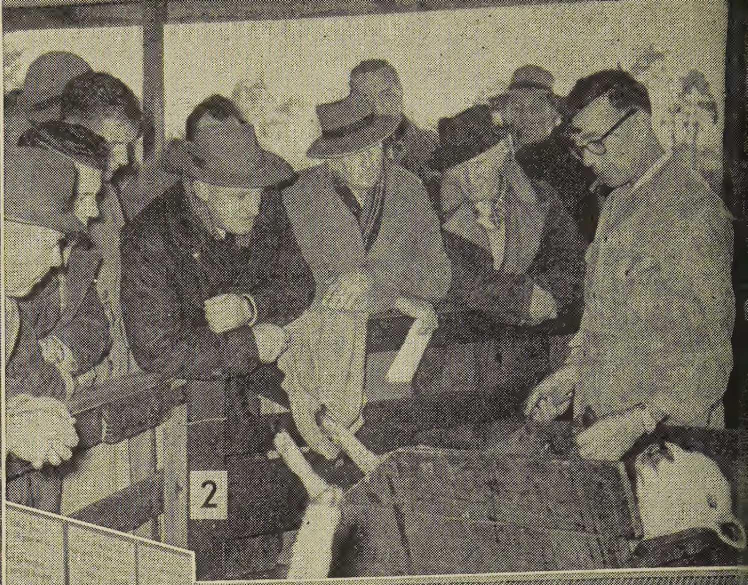
REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE.

Field Day at Ruakura


Experiments at Ruakura-Massey and Lincoln Colleges show that the first cross ewe produces - more lambs heavier lambs more wool
But what happens after the first cross?

1



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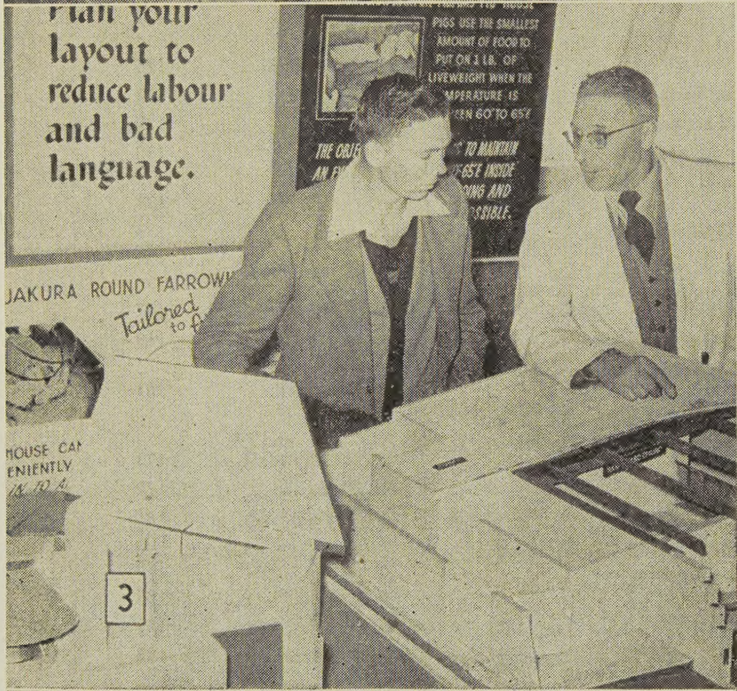

layout to reduce labour and bad language.
PIGS USE THE SMALLEST AMOUNT OF FOOD TO PUT ON 1 LB. OF LIVEWEIGHT WHEN THE TEMPERATURE IS BETWEEN 60 TO 65°
AKURA ROUND FARROW
Tailored to

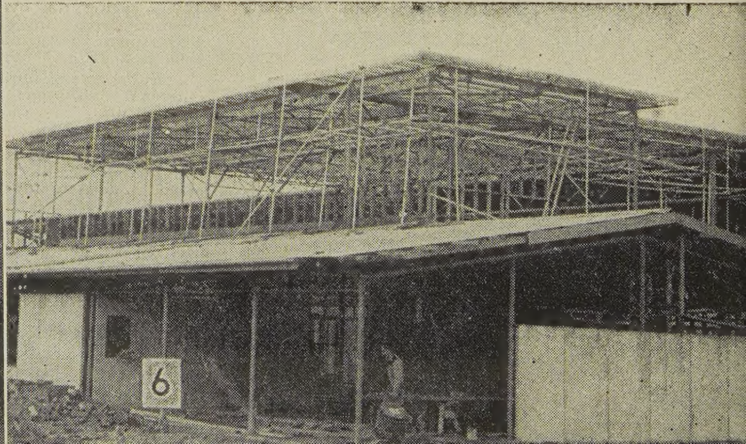
3

4

1—I. J. Inkster discusses the work at the Whatawhata Hill Country Station on selection and crossbreeding for improved fertility in the ewe. 2—C. R. Ensor demonstrates some of the methods described in his recent "Journal" articles on the Purua foot-rot eradication scheme. 3—I. H. Owtram demonstrating farrowing and fattening accommodation at the pig centre. 4—L. R. Wallace with a group of farmers interested in Ruakura studies of the effects of different planes of feeding the dairy herd before and after calving. 5—A pictorial presentation of the meat production per acre project at Ruakura under different stocking rates with sheep and with and without cattle. 6—Promise of permanence for the conference is the new hall nearing completion at the Station.

Stocking Rate and Ratio
DIFFERENT STOCK ~ SAME MANAGEMENT
per acre actually produced from each farm

5



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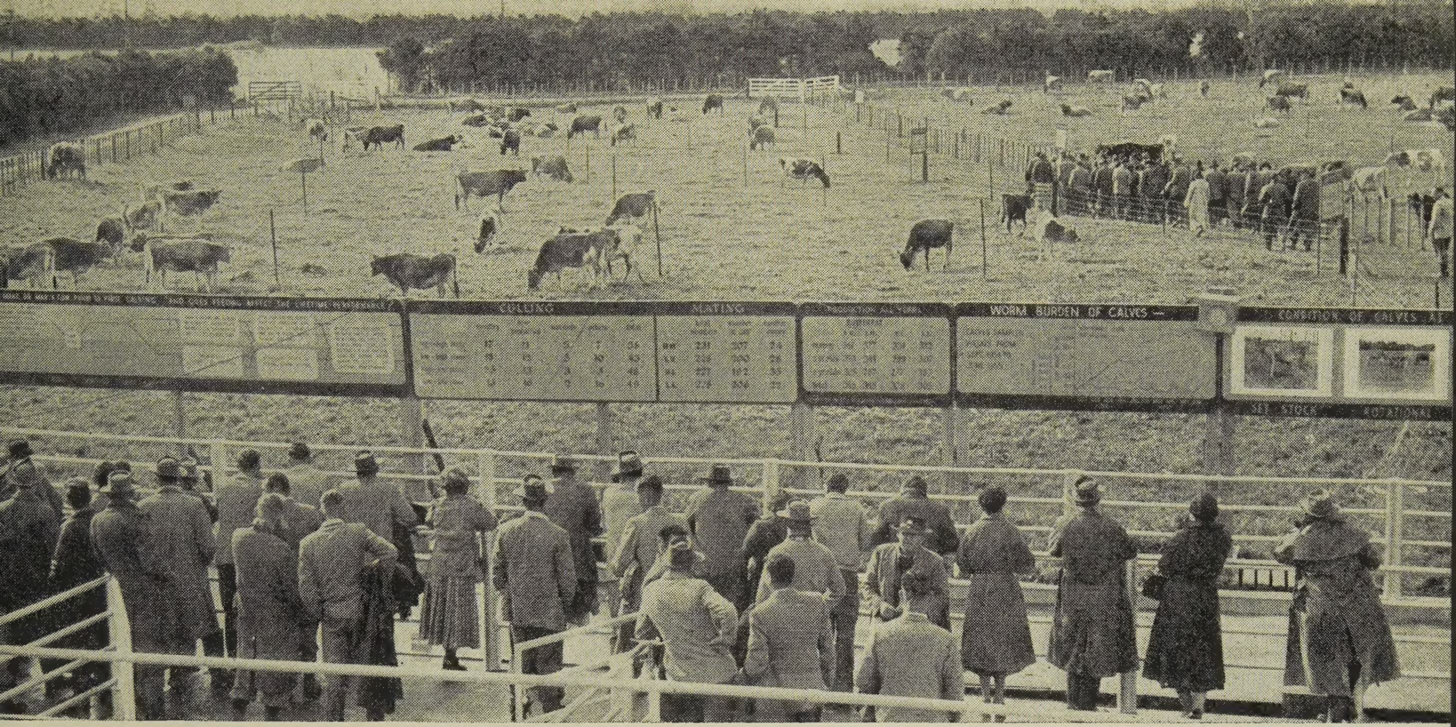


HEADING PHOTOGRAPH: Demonstration point No. 9, where against a background of data on the effect of grazing management on the lifetime performance of dairy stock, J. D. Cowan discussed with farmers the set stocking and rotational grazing methods. In the paddocks beyond are animals that are yielding current data on this long-term project.

Farmers' Conference Week at Ruakura

By G. J. NEALE

IN its ninth year the annual Ruakura Farmers' Conference Week, held this year at Hamilton in June, attained a scope of interest, a maturity of skill in display and organisation, and a measure of solid support by the farming industry that indicated its general acceptance as a permanent and valuable part of agricultural development in New Zealand. Those who attended must have shared the disappointment of the organisers at the failure to have the new conference hall at the Ruakura Animal Research Station finished in time. Accommodation for rapidly increasing attendances has been the only major limiting factor in the development and success of this occasion in the past few years.

DURING the 9 years' evolution of this now somewhat famous attempt by the Department of Agriculture's research station at Ruakura, in cooperation with the Waikato Farmers' Education Committee, to provide a week of practical extension work to farmers, a programme has been developed comprising one day of papers and discussions for sheep farmers, a field day for all farmers at the Station and at the Hill Country Station at Whatawhata, a day of papers and discussions for all farmers, and a day of papers and discussions for dairy farmers, with evening sessions of the panel discussion type.

At the field day 4 years ago a number of demonstrations was set up at several points about the Station and a continuous service round them was provided by a fleet of buses. This method proved so successful that it has been adopted every year since.

This year there were 14 demonstration points on the bus route and all visitors were provided with a map of the route and stopping points and a programme of the demonstrations. Buses circulated continuously past all points throughout the day, so that passengers could get on and off where they wished and spend as long as they liked at any particular points.

Facial Eczema Research

High light of the conference, both at the formal sessions and at the field

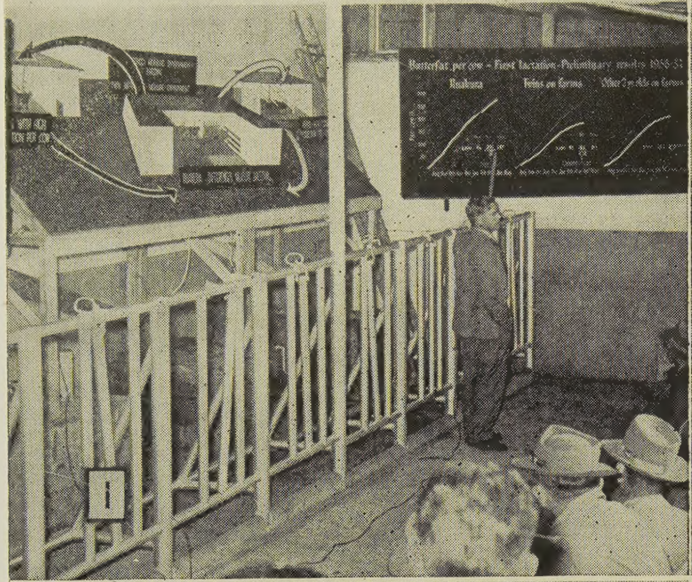
Field Day

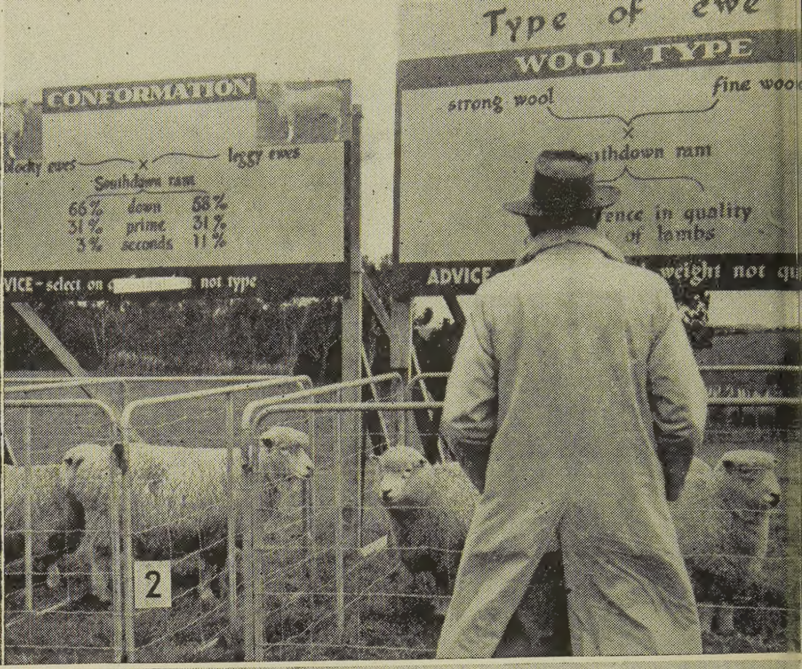
Demonstrations at the field day comprised:—

1. **Further Studies on Hogget Rearing:** E. A. Clarke.
2. **Cattle Yards: Increased Profit from Beef:** R. M. Gallagher. **Sheep Yards: Foot-rot Eradication:** C. R. Ensor. **Woolshed: Preparation of Second-shear Wool. Woolshed Paddock: New Fences.**
3. **Fertility of the Breeding Ewe: Management:** J. D. Scott. **Selection:** I. J. Inkster.
4. **Stocking Factors Affecting Lamb and Beef Production:** C. P. McMeekan.
5. **Selection and Management of Rams for High Fertility:** D. G. Edgar and T. J. McClure.
6. **The Basis of Fast and Efficient Milking: Dairy Shed Design:** W. G. Whittlestone, R. Parkinson, and M. J. McFetridge.
7. **Let Pigs Increase Your Payout:** D. M. Smith.
8. **New Zealand Dairy Board's Artificial Breeding Centre:** J. P. James and staff.
9. **The Effect of Grazing Management on the Lifetime Performance of Dairy Stock:** J. D. Cowan and J. W Keir.
10. **Crossbred Beef and Hybrid Pigs:** R. P. Newbold.
11. **Tile Drainage:** H. G. Hopewell and D. F. Scott.
12. **Silage Investigations:** R. J Lancaster. **Calf Rearing:** O. F. Parker. **Feeding the Dairy Herd Before and After Calving:** L. R. Wallace.
13. **Dairy Cattle Selection Experiment:** A. H. Carter and T. C. Hickmott.
14. **Staff Centre: The Ruakura Diagnostic Section:** D. C. Dodd, N. R. MacDonald, W. H. Bishop, and M. R. Coup. **Swede and Turnip Varieties:** H. McM. Bull.

Grass Drying Shed: Facial Eczema Research and Control: N. T. Clare, E. P. White, J. C. Percival, and D. D. Perrin.

Field Day at Ruakura


Ruakura
Twins on farms
1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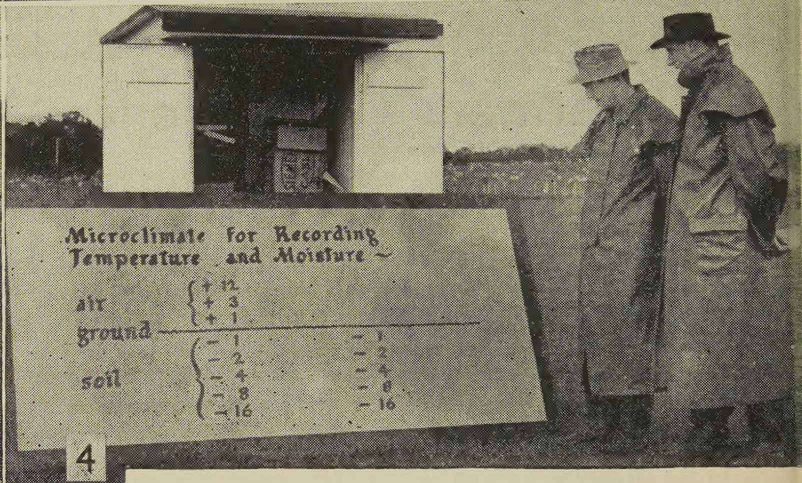
Microclimate for Recording
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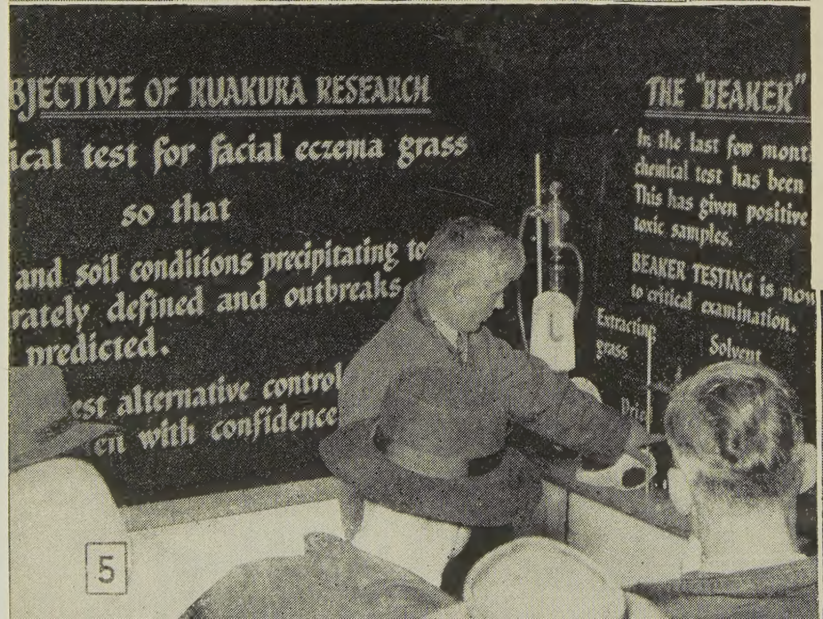
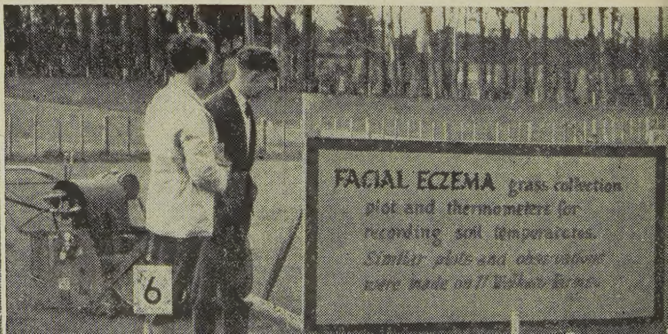
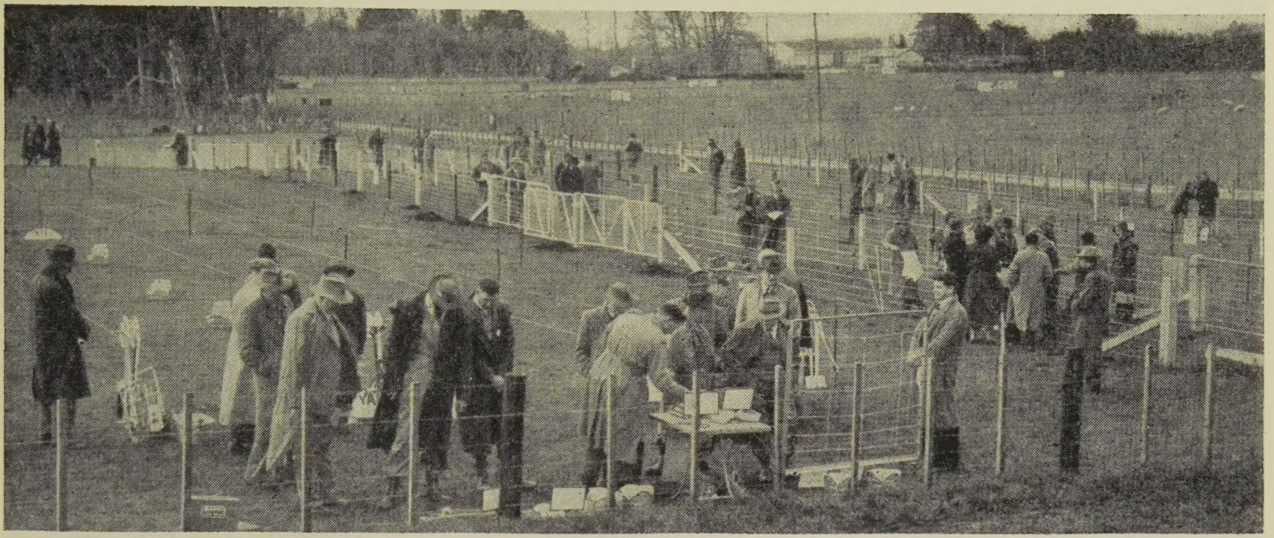
ground
soil { −1 −2 −4 −8 −16
−1 −2 −4 −8 −16
4


BJECTIVE OF RUAKURA RESEARCH
ical test for facial eczema grass
so that
and soil conditions precipitating to
rately defined and outbreaks
predicted.
est alternative control
en with confidence
THE "BEAKER"
In the last few mont
chemical test has been
This has given positive
toxic samples.
BEAKER TESTING is now
to critical examination.
Extracting grass
Solvent
Dri
5


FACIAL ECZEMA grass collection
plot and thermometers for
recording soil temperatures.
6

1—A. H. Carter explaining progress with research, using twin cattle split between Ruakura and co-operating farmers, into the effect of breeding and environment on production. 2—A demonstration of principles in selection of ewes for different characters. 3—In the facial eczema research centre dried grass samples are weighed into standard quantities and fed to guinea pigs to determine toxicity of the pastures from which the grass was collected. 4 and 6—Equipment established at many points in the search for a solution of the facial eczema problem. Air and soil temperature data and grass samples are taken and recorded in the search for possible correlation in subsequent tests. 5—D. D. Perrin explaining the so-called "beaker test" that appears to give a fairly reliable indication within 2 days of the toxicity of pasture.



At two of the demonstration points during the field day trade interests co-operated with the Station in displays. At point No. 2 new fencing and allied equipment (above) was shown, and at point No. 11 tile drainage machinery and methods were demonstrated.

day, was the evidence of appreciable advances in research into facial eczema.

In introducing a symposium of four papers on the disease and its control, Dr. J. F. Filmer, Director of the Animal Research Division of the Department of Agriculture, said that it was 16 years since the Department had first shown that liver damage could be produced by feeding toxic grass. Methods had been devised at Ruakura to prevent sheep from eating toxic pastures and the symposium was designed to assist farmers in taking those measures. It would deal with some of those measures taken at Ruakura and some of the difficulties associated with them.

For a number of years, said Dr. Filmer, papers on facial eczema had appeared on conference programmes, most of them by himself or by Dr. C. P. McMeekan, Superintendent of the Ruakura Animal Research Station. All the time, in the background, were men who were doing very active research but who had not appeared on the platform. Among these was Mr. N. T. Clare, Senior Biochemist at Ruakura, who had been doing work on the disease for 18 years, first at Wallaceville Animal Research Station after the serious outbreak of eczema in 1938, and subsequently at Ruakura. His work on the disease had been recognised throughout the world.

Four major advances in research into the disease in the past year were mentioned by Mr. Clare in his paper.

1. Nearly 1¾ tons of toxic dried grass has been collected this season and for the first time in the history of research into the problem the chemists have enough grass for all the experiments they can think up.

Papers and Speakers

Opening Address, E. G. Griffiths, Agriculture and Food Adviser to the United Kingdom High Commissioner.

"Brucellosis in Sheep—A New Vaccine", M. B. Buddle, Senior Veterinary Research Officer, Wallaceville Animal Research Station.

"The Lambing Beat on Hill Country", C. Mossman, Waerenga-o-kuri, Poverty Bay.

"Practical Experience in the Control of Foot-rot on a District Basis", C. R. Ensor, Veterinarian, Department of Agriculture, Whangarei.

"Whither Crossbreeding in Sheep?", A. L. Rae, Professor of Sheep Husbandry, Massey Agricultural College.

"The Maintenance of Health in the Ewe Flock", J. C. Gerring, Animal Research Extension Officer, Ruakura Animal Research Station.

"Meat per Acre with Special Reference to Beef Production", C. P. McMeekan, Superintendent, Ruakura, and D. E. K. Walker, Meat Research Officer, Ruakura.

"Crops for Facial Eczema Control", H. McM. Bull, Instructor in Agriculture, Department of Agriculture, Auckland.

"Feeding of Sheep on Hay", C. P. McMeekan.

"Disease Risks and their Control During Shutting Up", J. C. Gerring.

"Recent Progress in Facial Eczema Research", N. T. Clare, Senior Biochemist, Ruakura.

"Trace Elements for Plants and Animals", E. B. Davies, Senior Chemist, Rukuhia Soil Research Station, and I. J. Cunningham, Superintendent, Wallaceville Animal Research Station.

"The Control of Fly Strike and Lice in Sheep and Flies on Cows and in the Dairy Shed", P. L. Thomas, Scientific Officer, Wallaceville Animal Research Station.

"Swede and Turnip Varieties for Different Times and Different Uses", H. McM. Bull.

"Have New Pasture Species Increased the Hazards of Grazing Stock?", P. D. Sears, Director, Grasslands Division, Department of Scientific and Industrial Research, Palmerston North.

"New Facts on Topdressing", I. L. Elliott, Assistant Superintendent, and J. Karlovsky, Research Officer, Rukuhia Soil Research Station.

"Grazing Management in Relation to Pasture Production", R. W. Brougham, Ecologist, Grasslands Division, Department of Scientific and Industrial Research, Palmerston North.

"Weed Control in Pastures and Crops", F. B. Thompson, Agricultural Chemist, Rukuhia Soil Research Station.

"Concentrate Feeding of Dairy Cattle", L. R. Wallace, Chief Nutrition Officer, Ruakura.

"Silage Investigations", R. J. Lancaster, Biochemist, Ruakura.

"Meal Feeding of Pigs", D. M. Smith, Pig Research Officer, Ruakura.

"New Developments in Herd Improvement", J. W. Stichbury, Director of Herd Improvement, N.Z. Dairy Board.

"Milking Technique and the Herringbone Shed", W. G. Whittlestone, Senior Research Officer, Ruakura.

"The Advantages of Controlled Grazing", C. P. McMeekan.

2. Almost at one bound the concentration of the toxin has been carried from the 1/3000 stage, at which a bad hold-up occurred last year, to 1/20,000 this year.

Until the substance causing the liver damage is isolated in a state pure enough for it to be measured accurately there is little hope of carrying out much of the work that needs to be done. Isolation of the poison is considered of primary importance in the research.

3. A possible rapid test for toxicity of pasture has been developed from an observation made during the work of isolating the toxin. A white deposit that forms on the side of the beaker during evaporation of samples from toxic pasture does not form from non-toxic samples.

The so-called beaker test opens up great possibilities for field studies of the disease. It will be possible with this method to test a number of areas and to know within 2 days if any are likely to contain toxic grass. On such areas it will be worth while to carry out trials of management methods to control the disease and to run experiments to find which pastures contain the poison.

4. With adequate supplies of grass now available and with chemical studies at a stage where future work holds much more promise of results, both young graduates and specialists in other institutions will be much more attracted to facial eczema research.

Arrangements have been made recently for chemists elsewhere to collaborate in certain aspects of the work at Ruakura for which special equipment and training are required.

The discussion that followed the presentation of the four-paper symposium on facial eczema indicated general satisfaction with the progress of research and realisation of the complexities of the chemistry of the work.

Lice, Ked, and Fly Control

How to Use Insecticides

1. If you have occasional louse trouble, never see keds, never have blowfly trouble, have always used an arsenical dip successfully, and do not like "new-fangled" things,

use an arsenical dip. You will probably have to pay more than for more modern preparations, but you will not get troubles due to stripping or exhaustion of insecticide that occur with other dips.

2. If you have lice and keds,

use a BHC dip or a low-strength aldrin or dieldrin dip and follow the instructions carefully, paying particular attention to the manufacturers' recommendations about reinforcement.

3. If you have lice and keds and a hole in the boundary fence, or a little bit of fly trouble,

use a fly dip ensuring 1 month's protection against strike and much longer protection against lice and keds; that is, 0.5 per cent. DDT or BHC; 0.025 per cent. aldrin or dieldrin.

4. For longer blowfly strike protection

use the higher-strength dips; 0.05 per cent. aldrin or dieldrin or 0.02 per cent. diazinon meet most requirements.

5. For jetting lambs at marking time

use 0.1 per cent. aldrin or dieldrin or 0.04 per cent. diazinon if there are more than 10 weeks between docking and the next preventive operation, or half that strength if a shorter time intervenes.

Relative efficiency of aldrin and dieldrin

At equal concentrations dieldrin is slightly superior to aldrin under what are considered in New Zealand to be severe conditions and the superiority is likely to be measurable in weeks, but not in months. However, under moderate conditions dieldrin will continue to give a better degree of partial protection after the break in absolute protection. There are certain price advantages in favour of aldrin.

—*P. L. THOMAS, Scientific Officer, Department of Agriculture's Wallaceville Animal Research Station, in a paper to the Ruakura Farmers' Conference Week, June 1957*

Demonstrations at Ruakura Station during the field day showed the scope of the research. With greater quantities of toxic grass available new driers have been built and installed, and buildings, cages, grinders, and all the accessory gear for breeding much greater numbers of guinea pigs and using them for testing the grass have been assembled. These facilities, which were the centre of great interest on the field day, enabled the handling of much larger quantities of pasture samples during the past autumn. From 12 areas within 25 miles of Ruakura 8 tons of dried grass was collected from mowings of 2-acre areas at each point every second day. When conditions looked dangerous these areas were cut daily and larger amounts mown. Unfortunately little of the grass proved toxic. At Manutuke Station near Gisborne and from nearby areas the same procedure yielded nearly 5½ tons of dried grass, 1¾ tons of which is toxic.

Vaccines for Ram Infertility

Lively interest was shown in a paper by M. B. Buddle, Senior Veterinary Research Officer, Wallaceville Animal Research Station, in which results of field work with a new vaccine developed at Wallaceville for control of infertility in rams were announced. The new vaccine, used in conjunction with Strain 19 vaccine, has given very effective control of the disease causing infertility. The vaccines are being made commercially and will be available for use by veterinary surgeons on rams for sale this season.

During discussion of his paper Dr. Buddle answered many questions on the transmissibility of the disease from infected rams to other rams and ewes, and on the possibility of eventually attaining a completely clean flock by use of the vaccine on rams.

A very hearty vote of thanks to all those who had worked toward the development of the new vaccine to combat a very serious disease of sheep was requested of the meeting by Mr. F. C. Johnstone, deputy chairman of the New Zealand Meat Producers Board. In expressing the gratitude of farmers for research done at Wallaceville, Mr. Johnstone asked that they should not overlook the early work on infertility in rams done by Mr. R. Crawford and the Gisborne Veterinary Club.

"Proceedings" of Conference

Those who paid conference fees will receive a copy of the printed "Proceedings", which include all papers and principal discussions. Orders for other copies (10s. each) must be placed early with Publications Section, Department of Agriculture, Box 2298, Wellington, or with the Ruakura Animal Research Station, P.B., Hamilton.

All photographs by Niederer.

The Home Orchard in Spring

[*Sparrow*

SPRING activities in the home orchard are discussed in this article by S. P. Money, Instructor in Horticulture, Department of Agriculture, Wellington. They include routine spraying, application of fertilisers, cultivation, and descriptions of some of the insect pests which may be troublesome during the year.

SPRAYING

THE spraying programme in the home orchard must be carefully carried out if crops are to be well protected. Efficient spraying equipment capable of applying the material to all parts of the tree is needed, and the sprays must be applied at the right time. Equipment which is satisfactory for young or small trees may be quite unsuitable for large bearing trees. Diseases and pests in home orchards are often worse at the tops of trees, nearly always because of inadequate spray equipment.

The extra cost of satisfactory equipment for bearing trees is soon recovered from the harvesting of crops of good fruit which would be badly damaged or lost if not sprayed properly. Most full-sized trees require at least a gallon of spray material for efficient protection. When there are more than seven or eight mature trees, especially if they include some of the more vigorous stone fruit varieties, it is well worth while to invest in a knapsack sprayer, which of course can be used for the spraying of other crops. For large home orchards the purchase of one of the many small powered units now available should be considered.

The first sprays in spring should be applied at the earliest noticeable bud movement, which is shown by loosening of the bud scales and swelling of the buds. New tissue is exposed from beneath the scales and it is here that the leaf curl fungus of peaches and nectarines gains entry unless checked by a bordeaux spray cover. From this time on regular spray applications are essential to give continued complete cover to provide protection against various diseases and pests.

Care in the mixing of sprays is important. Serious damage can occur when the spray is too strong or when sprays are mixed indiscriminately. When proprietary brands of spray materials are used the manufacturers' directions printed on the labels should be followed carefully. Valuable pieces of equipment are a measuring glass and small scales, which eliminate guesswork.

Protection of Bees

The movement of bees in the orchard at blossom time is essential for the setting of a crop. There are many natural factors which may interfere with this, such as prolonged cold, wet weather or strong winds over the blossoming period. Lack of bees may account for an absence of crop, especially when the failure is confined to one type of fruit which normally sets fruit satisfactorily and has blossoms at a different time from the rest of the orchard.

In the home orchard, where usually there is a variety of trees blossoming at different periods, there is a tendency to apply the petal-fall sprays at one time for convenience. Apart from the sprays being applied at the wrong time on some trees, the greatest danger lies in poisoning bees.

Applying insecticides to trees in full or part flower not only causes deaths among bees visiting the flowers, but among those in the hives to which infected material is carried. Many bees are killed in this way each year, and it is in the home orchardist's own interest to take particular care not to endanger insects which are so useful to him.

HOME ORCHARD . . .

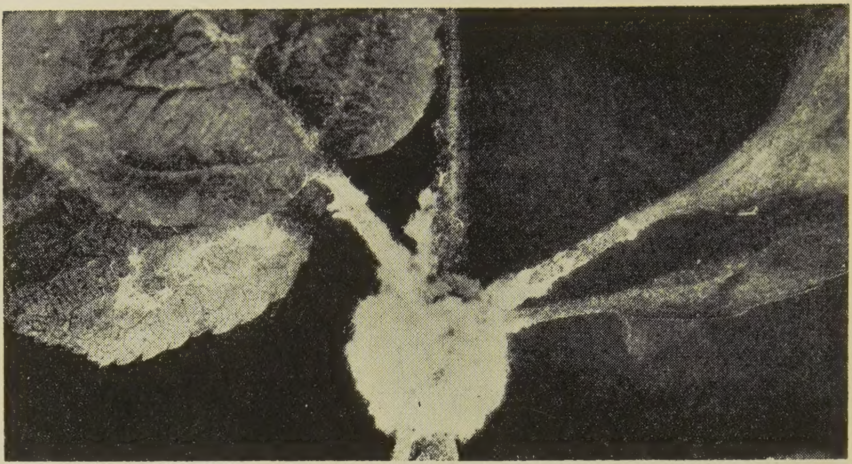
Insect Pests

It is important to inspect trees and berry canes periodically to check for insect pests. More than a casual glance is needed, and it will add interest to the job if the home orchardist owns a small hand lens. This can be obtained for a few shillings and is invaluable for detecting early outbreaks of red spider or the eggs of other insects.

The following descriptions of the main insect pests should help home orchardists to identify the various pests and thus to apply the effective sprays.

Codling Moth

The codling moth, a chewing insect, is the most troublesome with which home orchardists have to contend. This



[*A Shell photograph*

Woolly aphid infection on an apple twig, showing the typical waxy threads secreted by the pest.

Sprays for Control of Insect Pests and Diseases in the Home Orchard

APPLES AND PEARS

Time of application	Treatment	Pest or disease
Buds showing green tips	Bordeaux mixture (6oz. of copper sulphate and 5oz. of hydrated lime to 4 gallons of water) or lime sulphur (1¼ pints to 4 gallons of water)	Black spot
Petal fall	*Lime sulphur and DDT (¼ pint of lime sulphur plus ½oz. of DDT 50 per cent. wettable powder to 4 gallons of water)	Black spot, powdery mildew, codling moth, bronze beetle
†3 weeks later	‡Lime sulphur and DDT (¼ pint of lime sulphur plus ½oz. of DDT 50 per cent. wettable powder to 4 gallons of water)	Black spot, powdery mildew, codling moth, bronze beetle, leech

* Bordeaux mixture 3 : 4 : 50 strength (4oz. of copper sulphate and 5oz. of fresh hydrated lime to 4 gallons of water) may be used on pear trees in place of lime sulphur sprays.

† Repeat this spray at intervals of about 18 days until a month before the apples are ready to pick.

‡ If leaf-roller caterpillar is troublesome, use arsenate of lead (1¼oz. plus 2½oz. of hydrated lime to 4 gallons of water) instead of DDT.

In late spring woolly aphids may become troublesome and sprays of lindane wettable powder or emulsion may be used.

In January or February summer oil (⅓ pint to 4 gallons of water) may have to be applied to control red mites. Two sprays 10 to 12 days apart are necessary. Oil sprays must **not** be applied sooner than 14 days before or after sulphur sprays.

BERRY FRUITS (Except Strawberries)

Time of application	Treatment	Pest or disease
Bud movement	Bordeaux mixture (6¼oz. of copper sulphate and 5oz. of hydrated lime to 4 gallons of water) plus 1oz. of arsenate of lead	Leaf spot, botrytis, leaf-roller caterpillar
Fruit set	Bordeaux mixture (5¼oz. of copper sulphate and 5oz. of hydrated lime to 4 gallons of water)	Leaf spot, botrytis
After harvest	Bordeaux mixture (as above)	Leaf spot

STRAWBERRIES

Time of application	Treatment	Pest or disease
Pre-planting (foliage dip)	Bordeaux mixture (3oz. of copper sulphate and 3oz. of hydrated lime to 4 gallons of water)	Leaf spot
Mid-August Mid-September Mid-October	Repeat above spray	Leaf spot
After harvest	Repeat above spray as required at monthly intervals	Leaf spot

STONE FRUITS*

Time of application	Treatment	Pest or disease
Bud movement of leaf buds	Bordeaux mixture (6oz. of copper sulphate and 5oz. of hydrated lime to 4 gallons of water)	Leaf curl, shot hole, bladder plum, brown rot

Repeat the above spray in 7 to 10 days at 4oz. : 5oz. : 4 gallons strength where leaf curl has been particularly severe in past seasons or when the weather is cold and wet after the first spray.

Time of application	Treatment	Pest or disease
†Before blossoms are fully open	Lime sulphur and colloidal sulphur (¼ pint of lime sulphur plus 1½oz. of 40 per cent. or 2½oz. of 25 per cent. colloidal sulphur to 4 gallons of water)	Brown rot, shot hole, leaf rust

* Lime sulphur sprays should **not** be applied to apricots, as their foliage does not tolerate this spray. A 3 : 4 : 50 bordeaux spray (4oz. of copper sulphate and 5oz. of hydrated lime to 4 gallons of water) should be applied instead.

† Repeat at intervals of 3 to 4 weeks until 3 weeks before picking. Where leech (pear or cherry slug) is troublesome apply DDT (50 per cent. wettable powder at ½oz. to 4 gallons of water). If aphids are present, lindane emulsion (1 fl. oz. to 4 gallons of water) should be added.

Brown Rot

In home orchards where brown rot has been particularly troublesome use of one of the newer spray materials which have shown great promise under trial may be valuable. These sprays can be used with safety on apricots. A suitable spray programme is:—

Time of application	Treatment	Remarks
During flowering season	Dichlone (⅓oz. to ½oz. of 50 per cent. material to 4 gallons of water)	Do not mix with summer or winter oil
Rest of the season at 2- to 3-weekly intervals	Captan (1oz. to 2oz. of 50 per cent. material to 4 gallons of water)	Do not mix with summer or winter oil, bordeaux mixture, or lime sulphur

CITRUS TREES

Time of application	Treatment	Pest or disease
Petal fall of main blossom	Bordeaux mixture (4oz. of copper sulphate and 5oz. of hydrated lime to 4 gallons of water)	Verrucosis and other fungous diseases

Spray in October, November, and December with the same mixture if verrucosis has been troublesome.

Time of application	Treatment	Pest or disease
Early February	Summer oil (1 pint to 4 gallons of water)	Scale insects, sooty mould
Late May	Bordeaux mixture (as for petal fall of main blossom) plus summer oil (as above)	Brown rot, hard wax scale

insect is most familiar as a white, grub-like caterpillar which bores holes in apples and pears and is thus found there when the fruit is picked.

The adult moth is seldom noticed unless traps are set for it. It is an inconspicuous, light brown insect about ½in. long which flies at night. It lays its eggs on the leaves, twigs, and fruit of apples and pears, and the resulting caterpillars eat their way into the fruits to devour the seeds.

[*Sparrow*

Bees visiting blossoms which have been sprayed with insecticide carry spray to the hive, unless they die before reaching it.

Woolly Aphid

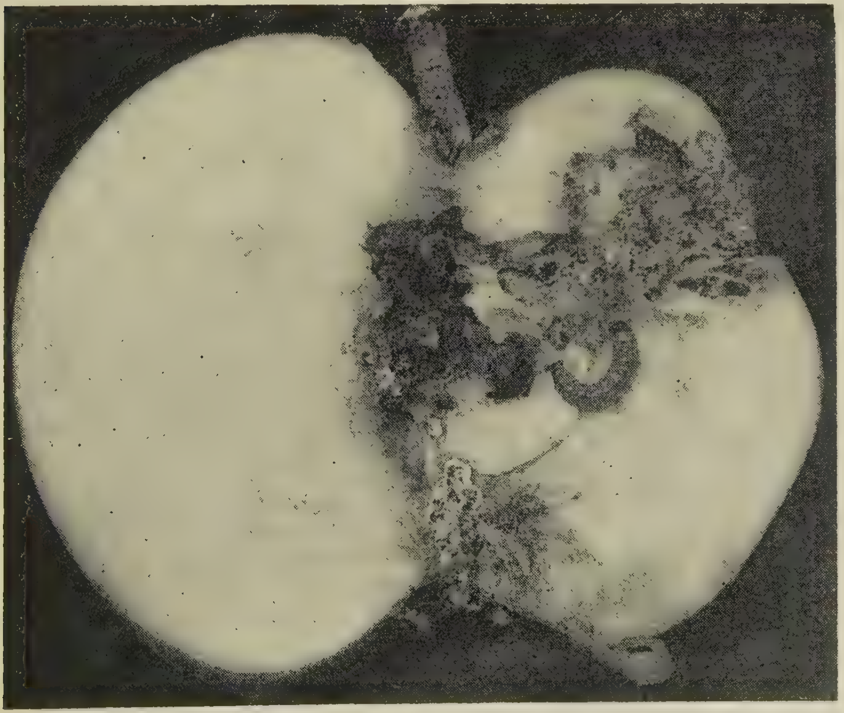
The woolly aphid is a sucking insect found on apples and pears. This aphid is similar to other aphids except that it can secrete a white waxy covering, from which it derives its name.

When large numbers of woolly aphids are present the trees have patches on them which look like cottonwool. Severe infestations of these insects can destroy many buds on new growth and thus directly reduce future crops.

The woolly aphid has a natural enemy, a tiny wasp which lays its eggs in the body of the aphid. The growing larva lives in the aphid, which it eventually kills. Aphids which have been parasitised in such a way can be easily seen as black bodies among a group of live aphids. A closer inspection with a magnifying glass will show a hole in each of these bodies from which the young adult wasp has emerged.

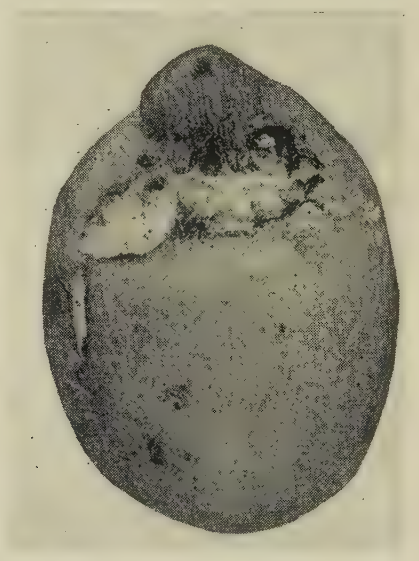
Red Spider

The red spider is a tiny, inconspicuous insect found on most tree fruit varieties, raspberries, and black currants. An infestation if unchecked can cause a severe set-back to trees or canes. In winter and early spring the egg masses of this insect can be seen on the twigs and bark as a red, dust-like covering and are most evident in the shelter provided by wrinkles, cracks, and leaf scars.



[*A Shell photograph*

Codling moth caterpillar in an apple.



Lemon injured by leaf-roller caterpillar.

In spring the tiny spider mites hatch out and move about the tree in search of food. These are sap-sucking insects and during the dry summer they cause the foliage to lose colour. In the early stages the foliage looks unthrifty, but when infestation is severe the leaves take on a bronze appearance.

Leaf-roller Caterpillar

The leaf-roller caterpillar is a chewing insect which has the habit of providing protection by either bending a leaf over itself and sealing this down with threads or sealing two leaves

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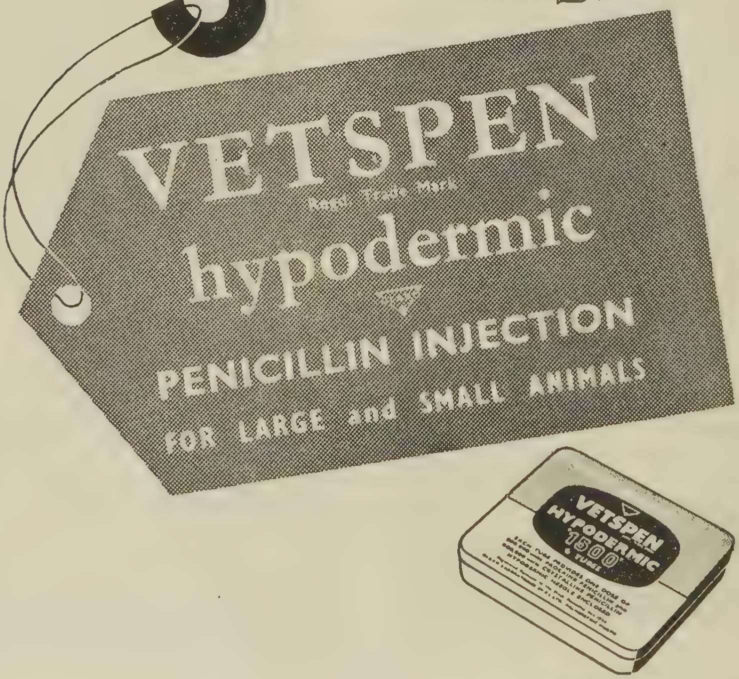

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together. This type of protection makes it essential to spray thoroughly. As the leaf-roller caterpillar is not controlled by DDT, spray programmes should be modified to include arsenate of lead where this pest is a problem.

Apple Leaf Hopper

The apple leaf hopper is usually seen only when disturbed and then it may be noticed as a very small white insect flying about in the shade of the tree. In the home orchard it is not as serious as in commercial orchards. It is a sucking insect and the damage it causes can be seen as a fine mottle of the leaves. The effect of this insect, like that of the red spider, is more noticeable in dry weather.

MANURING

Lime

Lime affects the soil both physically and chemically. It is not a fertiliser in the sense of blood and bone, but it supplies calcium, one of the essential elements for plant growth. At the same time lime has the effect of reducing soil acidity, though too much lime can bring the soil to a neutral or even alkaline condition, which can be detrimental to plant growth.

Types of Lime

Three types of lime are used in the home orchard, burnt lime (calcium oxide), hydrated lime (calcium hydroxide), and agricultural or garden lime or ground limestone (calcium carbonate).

The equivalent rates of application of these various types of lime are: 1lb. of burnt lime = 1½lb. of hydrated lime or 2lb. of agricultural lime.

Burnt lime is not very useful to the home orchardist, as it is caustic and could damage plants, besides being difficult to store.

Hydrated lime, used for bordeaux spray mixture, can be used quite safely for liming in the orchard. It should be stored in a dry place, either in a strong paper bag or in a tin with a tightly fitting lid.

Ground limestone (agricultural or garden lime) is the most commonly used and cheapest form of lime for garden application. Almost all lime now sold is of good quality, but as the size of the particles can vary considerably and fineness is important, it is wise to inspect lime before it is purchased to make sure it is finely ground. The quality of lime is not related to its colour.

Application of Lime

Lime should not be applied haphazardly. A common mistake by the layman is to guess the application rate. This can be harmful, especially where only light dressings of lime are needed. It is wise to measure the area where lime is to be applied (stepping will do) and then to weigh out the amount of lime at the rate decided on. If there is a very large area, it should be divided into workable portions and the amounts of lime for the various sections applied in turn so that over-all application is even.

On most soils which are of average acidity 3oz. to 4oz. of agricultural lime per square yard is sufficient. Where the soil is very acid more may be needed, but when this is necessary it would be well to find out from local Department of Agriculture officers the normal lime application for the district.

The acidity of soils is measured on a scale called the pH scale, which ranges from pH 0 to pH 14; pH 7 is neutral, acidity increases toward pH 0, and alkalinity increases toward pH 14.

The best range for most plant growth is pH 5.6 to pH 6.5, a slightly acid condition. A rough guide can be obtained by using indicator strips. These are small booklets of coloured paper which change colour according to the degree of acidity. These booklets should be available through seedsmen.

Manuring in a grassed orchard. Spreading fertiliser on the sward round trees in a circular band from a foot or so from the butts to just beyond the spread of the branches.

Fertilisers

The main aim of fertilisers is to give the plants sufficient nitrogen, phosphorus, and potassium for healthy growth. A brief explanation of the functions of these elements and examples of the most common fertilisers used in the home orchard follows.

Nitrogen

Nitrogen is responsible for stem and leaf growth. Too much nitrogenous manure will promote excessive growth at the expense of flowers and fruit. Some examples of the nitrogenous manures are:—

Dried blood (12 per cent. nitrogen).

Blood and bone (about 7 per cent. nitrogen, 11 per cent. phosphorus). The nitrogen in this fertiliser becomes available more slowly than that in dried blood.

Meat meal and bone (less than 6 per cent. nitrogen, about 11 per cent. phosphorus).

Sulphate of ammonia (20 per cent. nitrogen). A very soluble, quick-acting form of nitrogen, but excessive use of it tends to acidify the soil.

Nitrate of soda (15 per cent. nitrogen). This is similar to sulphate of ammonia except that it does not acidify the soil.

Phosphorus

Phosphorus (phosphate) stimulates root development and generally helps to stabilise plant growth. Some examples of phosphatic manures are:—

Superphosphate (20 per cent. phosphorus).

Basic slag (16 to 22 per cent. phosphorus). The phosphate becomes available very slowly. Basic slag has various amounts of minor elements which are of value to plant growth.

Bonedust (25 per cent. phosphorus, 3 per cent. nitrogen). This manure is slow acting and used largely for bulb growing in the flower garden. In the home orchard it can quite well be replaced by superphosphate.

Potassium

Potassium (potash) is an important fertiliser for hardening vegetative growth, thus effectively balancing the effect of nitrogen. It is important also in helping to colour fruit. On some soils potash can be "fixed" very easily, so that even after potash has been applied excessive growth or lack of colour may be still apparent. On such soils additional side dressings of potash should be applied. The main sources of potassium are:—

Sulphate of potash (48 per cent. potassium oxide).

Muriate of potash (50 per cent. to 60 per cent. potassium oxide).

These two fertilisers are both highly soluble forms of potash, but there can be a tendency for muriate of potash to burn plants with which it comes directly in contact, particularly if the foliage is wet.

Wood ash (1 to 10 per cent. potassium oxide). The amount of potash available depends on the type of wood which has been burnt, but in any case wood ash, though not useful enough to replace the potassic fertilisers mentioned, is always worth putting on the garden in the small quantities usually available from garden incinerators.

Application of Manure

With continuous cropping adequate fertiliser applications are essential, but the quantities and types of fertilisers used must differ according to the natural fertility of various soils. The following mixtures may be used as a guide for a balanced fertiliser:—

For Apples, Pears, Apricots, and Plums

	Parts by weight
Blood and bone	2
Superphosphate	2
Sulphate of ammonia ..	1
Sulphate or muriate of potash	1

For Peaches and Sub-tropical Fruits

	Parts by weight
Blood and bone	1½
Superphosphate	1½
Sulphate or muriate of potash	1

For Citrus

	Parts by weight
Sulphate of ammonia ..	2
Blood and bone	2
Superphosphate	3
Sulphate or muriate of potash	1

For trees from 3 years to 5 years old 2lb. per tree is sufficient on most soils, but this could be increased by ½lb. to ¾lb. per year until the tree is 10 years old. The rate reached by the time the tree is 10 years old should be the annual dressing thereafter.

Trees and berry canes which are losing vigour should receive increased amounts of nitrogenous fertiliser, and potash may be reduced or eliminated for a year or two. On the other hand for trees that are too vigorous and not fruiting satisfactorily nitrogen should not be applied and potash applications should be increased.

Fertilisers should be applied at least 3 weeks before bud movement is expected. The common fault of applying the fertiliser too close to the tree should be avoided.

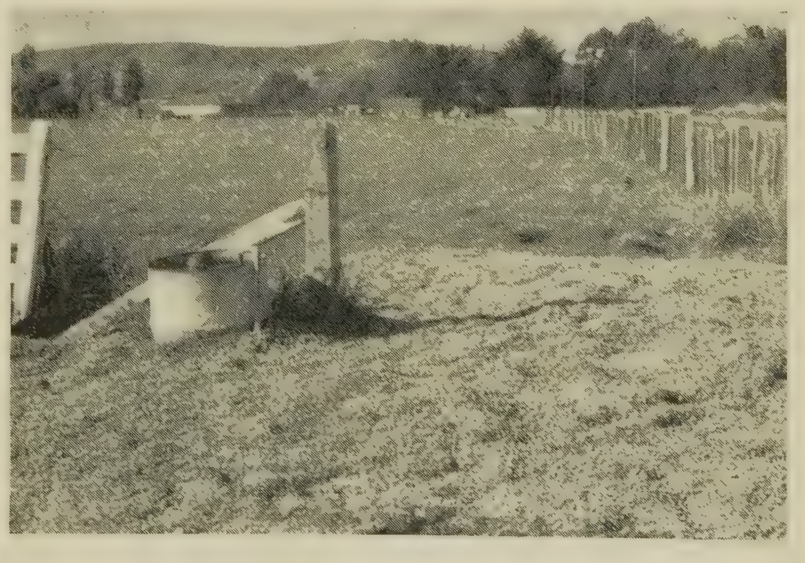
The main feeding area of trees and bushes is just short of and just beyond the ends of the branches. The fertiliser should be placed in a circular band 1ft. from the butts of small trees and shrubs and up to 3ft. from the butts of large trees to just beyond the spread of the branches.

SPRING CULTIVATION

Where the orchard is not in lawn and has been deeply cultivated during winter, light cultivation round the trees should begin as soon as the weather is favourable. After wet weather this type of cultivation is most helpful in reducing excess water.

Continued cultivation from this stage is essential if weed growth is to be kept under control, and in turn this will help to conserve moisture as the weather becomes drier. Disease control, too, is assisted by cultivation, because it eliminates some of the plants that harbour pests and diseases.

Wood Shavings Prevent Cutting up in Farm Gateways



THE wear and muddy condition of farm gateways caused by stock continually passing through, especially in wet weather, can be avoided if a load of wood shavings is placed in the gateway, as in the accompanying photograph. These can be obtained from mills or joinery works, often at no cost. They are clean and will not cling to the feet and legs of cows, which is a great advantage in the milking shed. Another advantage is that they do no harm or damage to the feet of animals as often occurs when sharp stones become wedged between the claws of the hoof. This is one of the causes of the disease foot abscess that is common in dairy cows.

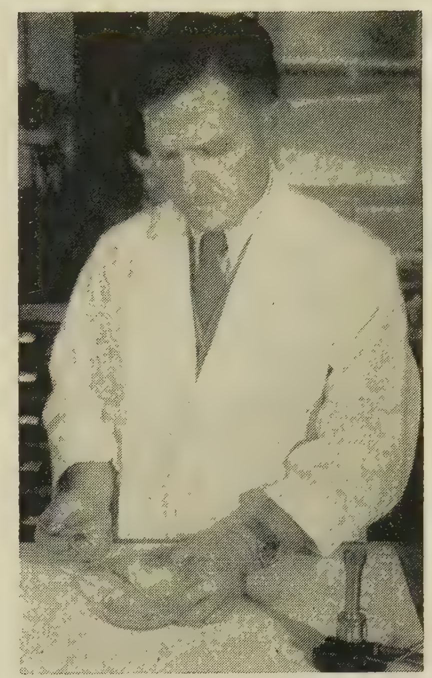
—*B. L. GRINDELL, Livestock Instructor,*

Department of Agriculture, Wairoa

Wallaceville Double Vaccination Procedure Gives

High Degree of Control of Infertility in Rams

A HIGH degree of protection against the disease causing infertility in rams has been conferred in field trials by a double vaccination procedure that has been worked out at the Department of Agriculture's Wallaceville Animal Research Station. The two vaccines used were Strain 19, used for the control of contagious abortion in cattle, and a new vaccine prepared from killed organisms of the disease causing the infertility, which is closely allied to that causing abortion in cattle. The vaccines are being prepared commercially and are now available for use by veterinary surgeons. This article is adapted from a paper delivered at the Ruakura Farmers' Conference Week in June by M. B. Buddle, Senior Veterinary Research Officer at Wallaceville, who developed the new vaccine and evolved the double vaccination method.



M. B. Buddle, who developed the new vaccine and evolved the double vaccination method described in this article.

THE importance of infertility in the sheep industry is well appreciated by farmers, veterinarians, and research workers. Infectious diseases contribute greatly to these losses. In New Zealand during the past few years intensive research has been concentrated on *Brucella ovis* infection in sheep. Infection of sheep with this bacterium, which is closely related to the organism causing brucellosis or contagious abortion in dairy or beef cattle, is widespread in New Zealand, Australia, and almost certainly in other major sheep raising countries.

The disease has most serious and lasting effects on the fertility of rams, a large proportion of affected animals being rendered permanently sterile. Infection is excreted in the semen of infected rams after localisation in the genital organs.

Detection by Palpation

Most farmers are familiar with the manual examination of the purses of rams by veterinary surgeons for the detection of abnormalities of the external genital organs. One of the commonest abnormalities detected by this method of examination is the condition referred to as "epididymitis", or inflammation of the epididymis. A large percentage of rams infected with *Br. ovis* do show enlargements detectable by palpation of the epididymis, an organ located within the scrotum attached closely to the testicle. All infected rams do not show abnormalities of the genital organs which can be readily recognised by this form of clinical examination.

This disease constitutes an important cause of ram wastage. Ewes may also become infected with the disease and deliver dead lambs up to full term or weakly lambs which may die within a few days of birth.

Infection of sheep with *Br. ovis* may be described as a venereal disease, as infected rams have been shown experimentally to transmit infection to clean ewes at tupping. Tupping also provides the greatest opportunities for spread of infection from infected to clean rams. However, clean rams may acquire infection from diseased rams even in the absence of ewes. The common habit of rams jumping one another is responsible for the dissemination of infective semen and the consequent infection of clean rams through mucous surfaces such as the rectum, prepuce, eye, nostril, or mouth.

Experimental transmission trials at Wallaceville have shown that rams and pregnant ewes may become infected after the drenching of suspensions of *Br. ovis* organisms. In other experiments, where non-infected rams and pregnant ewes were grazed on pastures intentionally contaminated with diseased afterbirths, none of these animals developed infection. However, the possibility is not excluded that individual rams and ewes may become infected by grazing on contaminated pastures.

Ram lambs, as young as 8 weeks of age, have been shown to be susceptible to experimental infection. On the other hand active disease did not develop subsequently in a group of ram lambs which were delivered and reared by a number of actively infected ewes.

Active infection is more persistent in rams than in ewes. In one experiment a group of ewes, all of which had diseased membranes at their first lambing, was observed over subsequent years. Only 4 of the original 26 infected ewes had diseased membranes at their second lambing and at their third lambing all ewes had normal membranes. Rams mated to these ewes subsequent to their first lambing failed to develop active infection.

Attempts at Treatment

Some attention has been directed at the treatment of affected rams. In view of the encouraging results from use of aureomycin, particularly when combined with streptomycin, in human *Brucella* infections this form of treatment was tested on a small group of experimentally infected rams at Wallaceville. Two other simpler and less expensive forms of treatment were applied to other groups. Aureomycin plus streptomycin was the only procedure which eliminated infection in all the treated rams. Treatment of individual animals of special value would have greater appeal if more economical and convenient forms of treatment were available which, in addition to eliminating infection, resulted in the animal regaining unimpaired fertility.

What methods of control are available in the light of present knowledge of the disease?

It is known that a significant proportion of infected rams can be detected by palpation of the scrotum. These rams are of doubtful fertility and serve as reservoirs of infection for clean rams and ewes. Obviously these rams should be culled from the flock. A number of infected rams do not exhibit obvious abnormalities of the genital organs in spite of being capable of transmitting infection in the semen. It is possible for these rams to be identified by laboratory examinations conducted on semen samples collected by an electrical stimulation method. For very practical reasons it is not possible to apply this supplementary method of diagnosis on a wide scale. However, by the institution of annual or even more frequent veterinary

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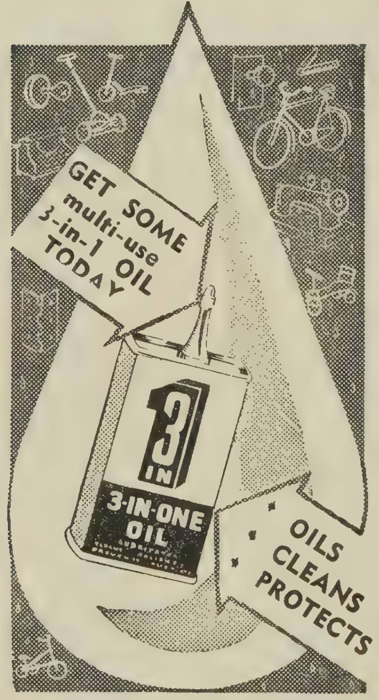

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examination of the ram flock and culling of the rams with palpable abnormalities of the genitalia, the incidence and spread of the disease have been substantially reduced on many properties.

Spread of infection may be further reduced by rigid isolation of the younger clean rams from the older rams. Infection can develop in ram hoggets and virgin 2-tooth rams after contact with older infected rams and every effort should be made to avoid such contact. Also young rams have been protected from contact with heavy infection during the tupping season by ensuring their segregation from the older rams or by confining their mating to ewes of their own age.

As soon as the infective nature of this disease was established research was undertaken to develop methods of conferring immunity or resistance on sheep against the disease to supplement other methods of control.

Development of Vaccines

In experiments at Wallaceville extending over the past 4 years attention has been directed at the development of vaccination procedures which would confer a high degree of immunity against controlled experimental infection. In a preliminary trial rams and ewes were inoculated with a variety of vaccines either singly or in various combinations. Vaccinated and non-vaccinated animals in the various groups were later exposed to severe infection by the intravenous inoculation of virulent *Br. ovis* organisms.

The only procedure which consistently conferred significant protection was the simultaneous inoculation of *Br. abortus* Strain 19 and a special vaccine prepared from killed *Br. ovis* organisms. Strain 19 is the vaccine used for the protection of cows against contagious abortion and is a suspension of living but non-virulent organisms. This vaccine was shown to be incapable of causing active disease in rams or ewes. The special *Br. ovis* vaccine contains chemically treated and killed organisms in an emulsion prepared from mineral oil. This method of preparation of the vaccine greatly improves its efficiency, so consequently this type of product has been called an "adjuvant vaccine".

Subsequent work has involved the use of larger groups of rams immunised at different ages with a variety of procedures. Again in the later trials Strain 19 with the adjuvant vaccine conferred a high degree of protection on rams against experimental infection.

Field Trials

In the first field trial, initiated on two properties in 1955, approximately half the 2-tooth rams were immunised with Strain 19 and the adjuvant vaccine and the remainder left untreated. The results after two examinations at the end of the 1956 tupping season are summarised in Table 1.

TABLE 1—RAM VACCINATION FIELD TRIAL, 1956

Infection in rams after first tupping season

2-tooth rams			Older rams	
Vaccinated	Non-vaccinated	per cent.	Non-vaccinated	per cent.
0/31	8/32	25	29/121	24

In this trial the vaccination procedure had obviously conferred a high degree of protection on the 2-tooth rams against heavy infection during their first tupping season.

The results from this trial and from more intensive experiments running concurrently at Wallaceville led to the decision in September last year to proceed immediately to a more extensive field trial. Through the collaboration of the Department of Lands and Survey the main part of the trial was located in the Rotorua district. Two different vaccination procedures were to be compared, Strain 19 plus the adjuvant vaccine and the adjuvant vaccine used alone. The latter procedure was included, as results from laboratory controlled experiments had indicated that an adjuvant vaccine used alone did confer some degree of protection. Vaccination was confined to the recently purchased 2-tooth rams and a number of these on every block were left untreated as controls. To ensure that the 2-tooth rams were exposed to severe infection during their first tupping season infected older rams were intentionally retained in the flocks and rams of all age groups were run together during tupping. Results are available from the first clinical examination conducted on the experimental 2-tooth rams after tupping.

Table 2 summarises the results from the blocks where groups of 2-tooth rams were vaccinated with Strain 19 plus adjuvant vaccine as well as with adjuvant vaccine alone. The results confirm the efficiency of the double vaccination procedure and demonstrate clearly that the adjuvant vaccine used alone did not confer adequate protection.

Table 3 summarises the available results from the flocks where the only treatment given was the adjuvant vaccine inoculated alone. Again on these blocks this procedure did not confer satisfactory protection.

TABLE 2—RAM VACCINATION FIELD TRIAL, 1957

Department of Lands and Survey, Rotorua district

2-tooth rams	Number	Cases	Per cent.
Adjuvant vaccine	159	8	5
Strain 19 plus adjuvant vaccine	174	1	0.6
Non-vaccinated	210	21	10

TABLE 3—RAM VACCINATION FIELD TRIAL, 1957

Department of Lands and Survey, Rotorua district

2-tooth rams	Number	Cases	Per cent.
Adjuvant vaccine	282	18	6.4
Non-vaccinated	341	37	10.9

Vaccination studies have been primarily concentrated on rams in view of the importance of the male as regards susceptibility and transmission in ovine brucellosis. The economic importance of *Br. ovis* infection in ewes is not yet so clearly established. As infection in ewes might originate exclusively from the use of infected rams, lamb losses through infection of the ewe might be most conveniently and economically controlled by confining vaccination to rams. Experiments are still in progress to determine whether vaccination of the ewe will confer protection against infection presented by the use of infected rams for tupping.

Vaccination Procedures

Vaccination procedures should be applied as follows for effective control of the disease:—

1. **Ram lambs after weaning should be kept in strict isolation from older sheep.**
2. **Young rams may be vaccinated at any age from 4 months until 2 months before their first tupping season. Vaccination as yearlings rather than at an earlier age will result in the development of better protection, and vaccination should therefore be left as late as possible.**
3. **Older rams should be examined by a veterinary surgeon and rams with clinical lesions of the disease should be culled from the flock. The remainder of the rams may be vaccinated either immediately or at any time until 2 months before the next tupping season.**
4. **Vaccination of ewes is not recommended at present, as it is not known if this would be effective.**

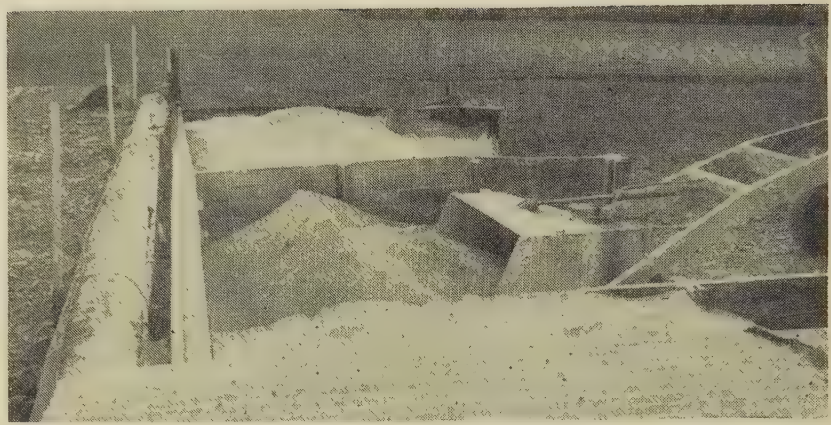
The vaccines are now being prepared in a commercial laboratory and are available for use by veterinary surgeons. Farmers wishing to arrange for the vaccination of ram hoggets and older rams are advised to consult their veterinary surgeon.

Though the vaccination field trials are incomplete at present, the available results indicate that the double vaccination procedure confers a high degree of immunity in rams against experimental and natural infection and will provide a formidable weapon for more effective control of the disease in the near future.

Partitioned Bulk Store for Air Strips

By H. McM. BULL,
Instructor in Agriculture, Department of Agriculture, Auckland

A PRIVATELY owned bulk store that offers a practical solution to a common problem on landing strips used by groups of farmers is described in this article. Between 500 and 1100 tons of lime and fertilisers pass through the store annually and are flown off the strip for some 15 farmers. The installation of partitions in the bulk store ensures that phosphates, lime, and phosphates containing minor elements can be stored separately on the strip at the same time. It also ensures that as each bin is emptied the following farmer can store his supply.



The bulk store bins, showing part of the metalled loading ramp (left), sighting staves, and the fixed guide rail for the sliding roof, shown in the foreground.

EACH bin holds 21 tons of superphosphate or 32 tons of lime. The local lorry capacity is a 7-ton load.

Operations normally begin on this strip at the end of October and continue through to Christmas, as during this time carriers are not fully employed trucking fat and store stock as they are from January onward.

Order of Sowing

In the first year a ballot is held for order of sowing. The farmer who sows first drops back to second place on his next use of the strip and the man who was last previously goes to the top. This system saves any discontent that may arise and avoids the owner of the strip being accused of preference. Individual farmers may exchange places, however, by mutual agreement provided others do not lose their positions on the ladder.

Costs and Maintenance

The owner of the strip is responsible for the care and maintenance of the runway and buildings and levies a sum agreed to by the farmers on every ton flown from the field. A proportion of the levy helps to pay for the laying down and grassing of the strip and the remainder the cost of the bins. It is expected that these will be paid for in 2 years, from when annual charges will be governed by the amount of maintenance required.

Obviously maintenance charges on landing strips will vary considerably according to the levelling required and the difficulties of holding a grass sward. Repair bills on the bins, too, could be heavy, partly owing to carriers' working at night and failing to see that the roof runways are free of fertiliser and to the use of heavy loading machinery in a confined space.

Alternative Designs

Where irregular transport is a difficulty it may be advisable to construct larger bins and risk the material packing down. Experience has shown that a modification of the roof design could be adopted with advantage to avoid extra weight, wear and tear, and the time necessary to push the long, single roof aside. With this roof in two sections running out on separate ramps at each end of the building less obstruction would be caused around the site and bins not in use could remain covered.

When a new building is contemplated the location of the bins in relation to the airstrip should be discussed with a representative of the aviation company operating off the strip, and the store should be built of the most rugged materials that finances will permit. A telephone is essential, preferably in some building equipped with cooking facilities for the pilots. This enables the operator, who of necessity is in full charge, to advise farmers of developments from hour to hour if necessary. He alone knows the number of machines available and the amount of fertiliser be expects to spread if weather conditions are favourable.

Book Review

"Sheep Shearing Experting": by L. D. Ryan

THE title of this book may not be self-explanatory to all New Zealand sheep and wool men, as it would to their counterparts in Australia, because "experts" and "experting" are words seldom used here. However, this book in its 214 pages contains in compact form a wealth of information for all sheepowners, shearers, and anyone else interested in the machinery contained in the normal wool shed, or shearing shed, to use the Australian term.

This is really the first book of its kind to deal exhaustively with the subject. That it is thoroughly up-to-date is evidenced by the inclusion of an informative and well-illustrated chapter on shearing tables, which have only recently come on the market. The evolution of the plant is followed from the early development of sheep shearing machinery in Australia—its home—through to its present highly efficient state.

There are chapters on the various types of overhead gear and their installation, maintenance, and use; on the shearing handpiece, its principles of operation, and the necessary care and maintenance to get the best performance; and on grinders and grinding. Each chapter goes into considerable detail, and what is even more important, is excellently illustrated, which makes all instructions and explanations easy to follow.

Belts and belt drives, lubrication, power units, and preparations for shearing are also dealt with. This book shows that Mr. Ryan has a thorough understanding of his subject and must have had considerable practical experience to be able to give the numerous small but valuable tips that he includes among the main subject matter. The inclusion of a good glossary rounds out a well-balanced and attractively printed and illustrated book.

—J.E.D.

Angus and Robertson Ltd., Sydney. 45s.

Package Bees

THOUGH the use of package bees is not extensive in New Zealand, some beekeepers in southern districts find their use economical, and more interest generally is now being taken in methods of handling and introducing them. In this article D. W. A. Seal, Apiary Instructor, Department of Agriculture, Invercargill, describes a method for setting up package bees which is very simple, gives wholly satisfactory results, and eliminates the use of sugar syrup or spraying with water to quieten the bees before introduction. The method also largely eliminates robbing, drifting of bees, and possible loss of queens.

A crate of four packages of bees being unloaded from an aeroplane.

IN southern districts of New Zealand winters are much longer than in other parts of the country and the toll of bees is inclined to be high; in addition a far greater amount of winter stores is required. To winter an average colony well 60lb. to 80lb. of honey is needed in addition to about 20lb. of pollen. A dearth of pollen in spring is another hazard for southern beekeepers.

The use of package bees procured from North Auckland, where the season is much earlier, greatly minimises these winter problems in the south. Once the crop has been extracted the colonies may be killed and all combs and equipment stored over winter, thus saving at least 60lb. of honey per colony normally used for winter feeding, and reserving the combs of pollen for spring, when they are most needed. It also eliminates the need for periodical winter inspections of out apiaries or the possible risk of damage to colonies and equipment by high winds and storms.

Another point in favour of package bees is that they are a simple and sure method of establishing young queens each season.

Past Methods

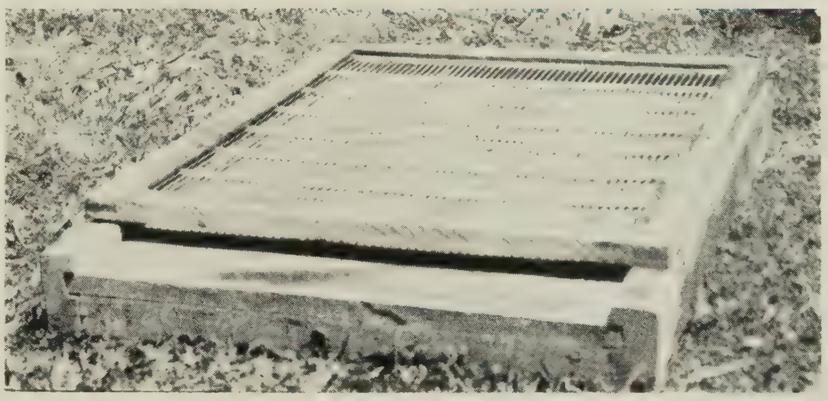
In the past, methods of setting up package bees have to some extent been rather complicated in addition to causing possible losses of queens and creating robbing where packages have been used to fill in winter losses in already established apiaries.

Southland beekeepers have found that a package 11in. x 10in. x 5½in. with wire gauze on the two sides and containing 2lb. of bees travels better than a package containing 3lb. of bees, and the risk of possible suffocation is minimised. Bees thus packaged in sets of four packages with a 2in. space between each package have travelled 900 miles by air and arrived in perfect condition.

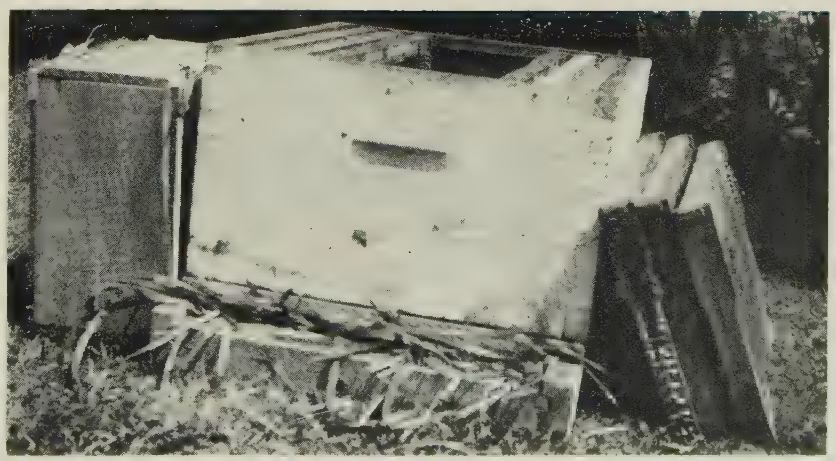
Packages dispatched from Kaitaia, North Auckland, in the morning can be set up in their hives in Invercargill district the same evening.

Establishing Package Bees

Mid-October is considered the best time to establish package bees in



Preparing the hive to establish package bees. Above—After the floor board has been set level the queen excluder is placed immediately on top. Below—The super of combs and stores has been placed above the excluder and the entrance plugged lightly with green grass. Three combs have been removed from the centre of the super to allow room to dump the bees from the packages.



Scabby Mouth *Vaccination*

On farms where scabby mouth occurs, each new crop of lambs should be vaccinated, and this is most conveniently done at marking. If lambs are not protected they are liable to suffer a severe check as the disease makes eating very painful.

Ewes which have not previously been exposed to the disease should be vaccinated at the same time as the lambs.

TVL

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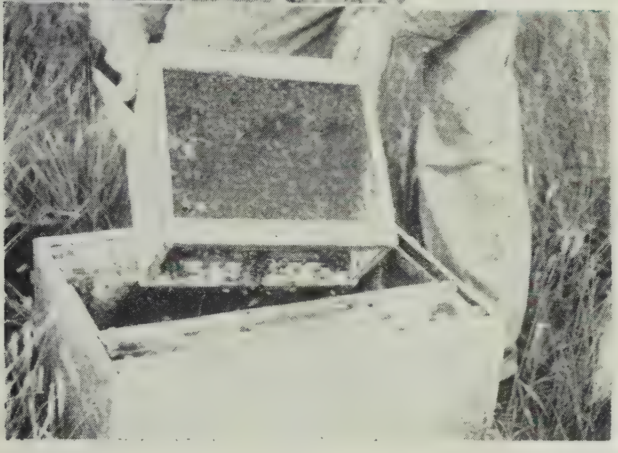
P.O. Box 29, Upper Hutt.

← Packages which have been removed from a crate for distribution in an apiary.



▼ The lid has been removed from the package and the bees are being dumped into the hive between the combs.

Southland. The equipment required for each is a hive floor, cover, excluder, mat, and super containing three full combs of honey and pollen which have been stored over winter from the previous season.

When the combs in the super are being arranged two combs of honey should be placed against one side, then a good pollen comb, and then the remaining empty combs. By this method the colony has stores handy on one side and room for expansion on the other.

After the floor board is set level the queen excluder is placed immediately on top, then the super of combs and stores. The entrance is then plugged lightly with green grass. This will have wilted sufficiently by the next morning to allow the bees to remove it gradually and thus prevent the sudden rush of bees and consequent confusion if the bees are released immediately. Three combs are then removed from the centre of the super to allow room to dump the bees from the packages.

After each package has been set out by its hive and the four nails which are normally driven through the sides of the package into the lid have been removed tipping the bees into the hive can be begun. From here on a hive tool is the only tool required. A smoker is not needed, but it is as well to have it ready in the event of accidents.

To open the cage first dump it lightly to dislodge the bees from the lid, then with the hive tool lever the lid off, dumping the package lightly twice while doing so. This gentle dumping tends to demoralise the bees and reduce the sudden urge to fly out.

It is essential that the dumping is done gently and is only sufficient to dislodge the bulk of the bees. It must be remembered that the caged queen and her attendant bees are attached to the underside of the lid and that any excessive dumping could cause damage to the queen.

Once the lid is off tip the bees into the space provided between the combs and replace the combs previously removed. The last operation is to place the caged queen in the hive.

The queen cage is quickly but carefully detached from the lid, the cardboard covering the candy removed and the cage placed between the combs and the largest area of wire gauze facing downward, the candy end being exposed to the hive bees. Placing the mat and then the cover on top completes the operation.

The removal of cardboard covering the candy, though not essential, permits a much earlier release of the queen and minimises the risk of suffocation should the outside temperature become abnormally high.

Quickness in placing the queen cage into the hive and covering it up is essential, as delay will permit bees to fly out and this should be avoided. If, however, a delay occurs, it is wise to place the mat over the combs during the delay. When all operations are complete the colony should be left undisturbed for about a week. At the end of this period the queen excluder is removed from the base of the hive and the colony carries on normally.

Experience so far has shown that crops from such colonies have equalled those gathered by over-wintered colonies, their use saves at least 60lb. of honey per hive, and there are no wintering worries. Package bees landed in Invercargill cost about £2; therefore, when all factors are compared they are an advantage to Southland beekeepers or to beekeepers in any district where winters are hard and spring pollen supplies are short.

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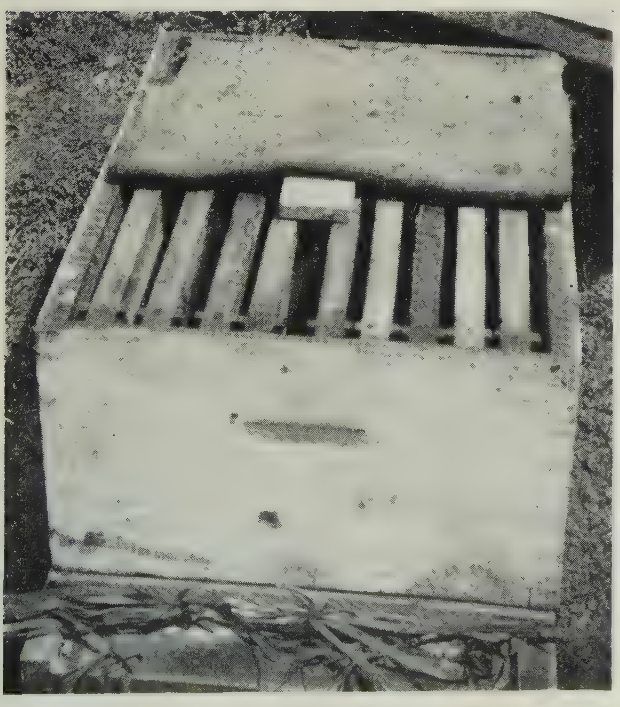
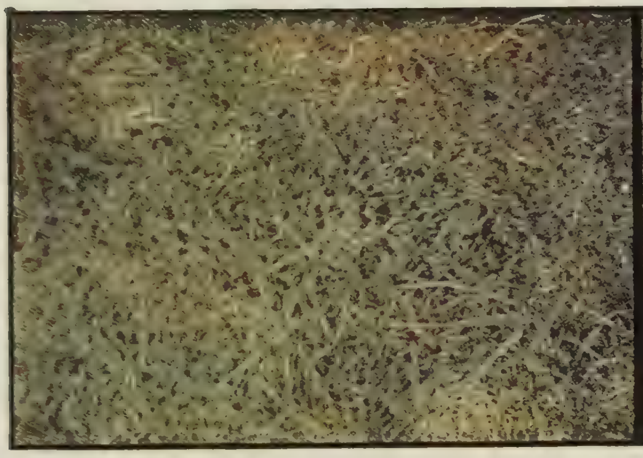


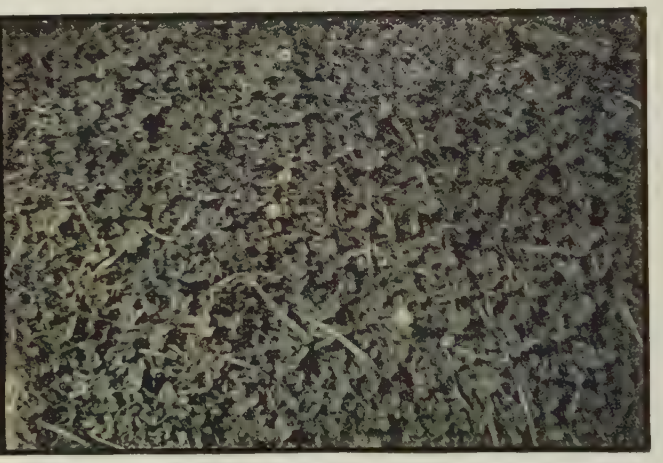
The queen cage in place. The mat has been folded for better ventilation.

Superphosphate was applied to this plot at 3cwt. per acre. Without molybdenum or tungsten the clover growth was not vigorous and pasture production was low.

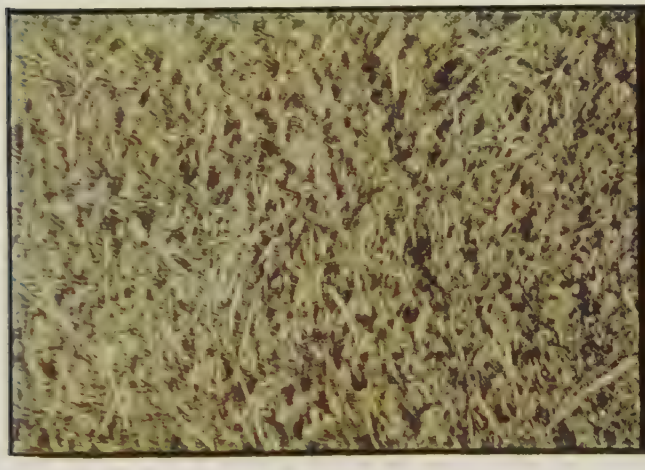
Superphosphate plus molybdenum at 2½oz. per acre gave greatly improved clover growth and much higher production.



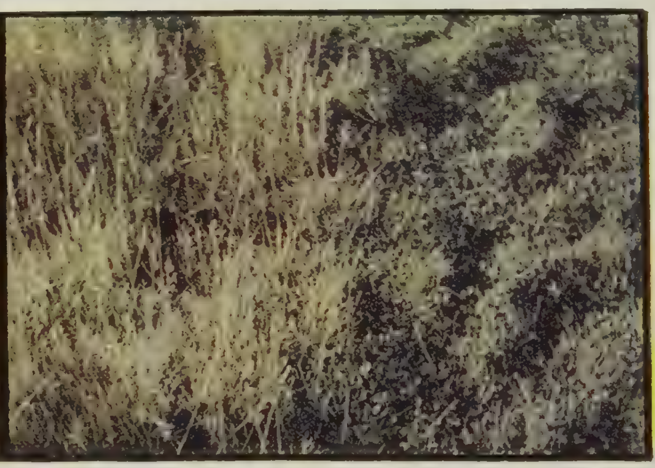
Superphosphate plus vanadium was similar to superphosphate alone; production was low.



The addition of tungsten to the superphosphate and superphosphate plus vanadium plots gave responses almost equal to those of molybdenum.



Calcium sulphate at 1½cwt. per acre added to half the basic slag-tungsten plots, brought about healthy growth of clovers and increased production.



Left—No molybdenum. Right—Molybdenum at 2½oz. per acre. (Basal dressing of phosphate and potash.) Molybdenised superphosphate applied to poor browntop-dominant foothill pastures will give improved production and greatly improved feed crops if the area is later brought into cultivation.

Recent Research Work

FERTILISERS FOR WAREPA SOILS

MOST of the foothill soils of Berwick, Maungatua, Woodside, Outram, and north Taieri areas, portions of the coastal hills from north Taieri to Taieri Mouth, and the St. Clair-Blackhead areas fall into the Warepa class, and many of the downs soils of South Otago are of a similar type. Over the last 7 years a great deal of experimental work has been done with the co-operation of local farmers and valuable information on the fertiliser requirements of these soils has been accumulated.

VALUE OF MOLYBDENUM

IN 1949 Mr. J. O. H. Tripp of Outram obtained excellent results from topdressing strips with basic slag at 2cwt. and 4cwt. per acre, though on the same field, which was predominantly browntop with some very poor clovers, there was no response to superphosphate at up to 1 ton per acre. This led to a revival of interest in molybdenum, which was found to be present in basic slag and observational molybdenum trials confirmed the value of this trace element.

In September 1951 a replicated mowing trial was laid down in an adjacent field to compare the following treatments: Superphosphate (3cwt.); superphosphate plus sodium molybdate (⅛oz.); superphosphate plus sodium molybdate (2½oz.); basic slag (3cwt.) and superphosphate plus ammonium vanadate (1lb.).

In the first season both rates of molybdenum in combination with superphosphate were equally effective and showed significantly higher yields than any other treatment. Superphosphate and basic slag were not reapplied in 1952, and in the 1952-53 season molybdenum had little effect, probably owing to shortage of phosphate or sulphur.

In 1953 (and annually since then) superphosphate and basic slag were reapplied with an over-all dressing of muriate of potash at 1cwt. per acre. In the 1953-54 season molybdenum plots again showed a marked yield advantage, but yields from the ⅛oz. application had begun to fall off in comparison with those of the 2½oz. rate. Nevertheless, 4 years after the start of the trial the ⅛oz. of sodium molybdate was still having a marked influence on yield

FAILURE OF BASIC SLAG

At the instigation of E. B. Davies, Senior Chemist, Rukuhia Soil Research Station, who had been responsible for the original experiments with molybdenum, sodium tungstate at 1lb. per acre was applied to one replication of the trial in September 1953. A response to tungsten almost equal to that of molybdenum very soon became evident on plots which had already been treated with superphosphate and superphosphate plus vanadium, but there was no response where basic slag had previously been applied.

Whereas superphosphate contains sulphur, basic slag does not, and the failure of the basic slag-treated plot to respond to tungsten pointed to the possibility of a sulphur deficiency. Consequently in September 1955 calcium sulphate at 1½cwt. per acre was applied to half of each basic slag plot. A very definite response to the calcium sulphate treatment followed. The occurrence of both phosphate and sulphate deficiency on this Warepa soil was confirmed in an adjacent trial, where the yield from calcium sulphate plus double phosphate was superior to that from either double superphosphate or calcium sulphate alone.

These findings could, in part at least, explain why some farmers on this foothill country have had good initial responses to basic slag followed by disappointing results from its continued use. They are also important at present when aerial application of double superphosphate is being considered by some farmers. Double superphosphate, like basic slag, does not contain sulphur and results from its use are likely to be disappointing.

REPEAT DRESSINGS OF MOLYBDENUM

Information on the necessity for repeat applications of molybdenum was also required and in September 1955 —4 years after the original molybdenum treatments were applied—repeat applications were made on half plots. Responses to these repeat dressings became apparent on the ⅛oz. per acre treatments within 3 months and by January 1956 were showing slightly on the 2½oz. per acre plots, indicating the desirability of applying further molybdenum after 4 years.

APPLICATION OF RESULTS

Warepa soils respond to applications of phosphate, sulphate, molybdate, tungstate and lime. From the results of these accurately measured trials, numerous observational trials and farmers' experiences the following general recommendations can be made for the Warepa soils:—

1. Molybdenum should be applied as early as possible in any cropping or pasture-improvement programme and thereafter at approximately 4-year intervals. Rates in excess of 2½oz. per acre should not be necessary.

2. Superphosphate, which supplies both phosphate and sulphate, should be applied with all crops and annual applications should be made to pastures. Good results have been given by 3cwt. per acre, but on some areas heavier applications may be payable. Autumn application promotes out-of-season pasture production and is to be preferred to spring treatment.

3. Phosphates which do not contain sulphur, such as basic slag and double phosphate, should not be used.

4. Provided molybdenum is used, liming at 1 ton per acre initially with moderate maintenance dressings equivalent to 3cwt. per acre per annum should generally be adequate.

5. Tungsten (1lb. per acre of sodium tungstate) has given very definite responses, the indication being that it is a substitute for molybdenum but is less efficient. It has no effect where molybdenum, even at a much lower rate, has already been applied.

—R. M. J. STOCKDILL

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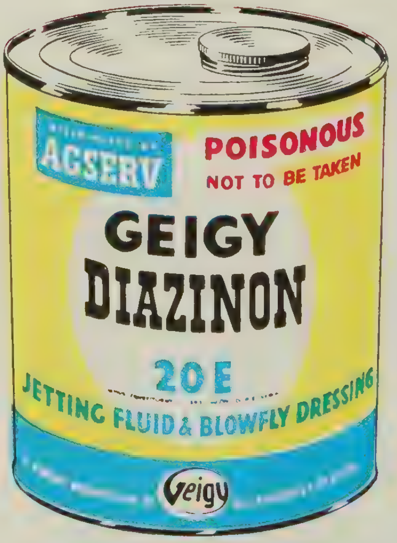

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Trees on the Farm

The Farm Nursery

Radiata pine seedlings in a farm garden in the South Island

MANY farmers will want to grow their own planting stock either as a matter of interest or because of the several advantages of home-grown stock. Chief among these advantages is that the plants are fresh and available when the planter and the weather are ready for them. This article by W. H. Jolliffe, Extension Forestry Officer, New Zealand Forest Service, is presented to assist those who wish to raise their own trees.

HOME-GROWN trees have the further advantages that they are becoming acclimatised to the locality from the time the seed germinates, that they are cheap, and that some specially good strain can be raised from personally collected seed.

Any garden soil can be used for the purpose, and friability and good drainage are more important than high fertility. In fact, an over-rich soil will result in soft, lush growth that might not survive the greater exposure of the permanent site.

The ground to be used for sowing this spring should have been deep dug last autumn in the same way as is usual for a vegetable garden. If sawdust has been used as a soil improver, a light dressing of a nitrogenous fertiliser such as sulphate of ammonia will assist decomposition. Other fertilisers should be used very sparingly, and then only if the soil is poor. If coniferous species are being grown, lime should not be added.

Sowing seed in bands in a raised bed

The Seed-bed

Though species with large seeds are sometimes sown in lines, tree seed is generally sown in raised beds. For convenience in weeding and wrenching the bed is usually about 3ft. wide and whatever length is necessary for the required number of plants. The length needed can be calculated by assuming that 600 1-year-old trees or 150 2-year-old trees can be grown on each yard of 3ft.-wide bed with three 6in.-wide bands.

The surface of the bed is raised by scooping out the topsoil from the strips that will form the side paths and throwing this material on the bed area. Some weeks before sowing, the soil should be worked to a fine tilth and the surface raked level and free of stones. A final raking should be given just before sowing

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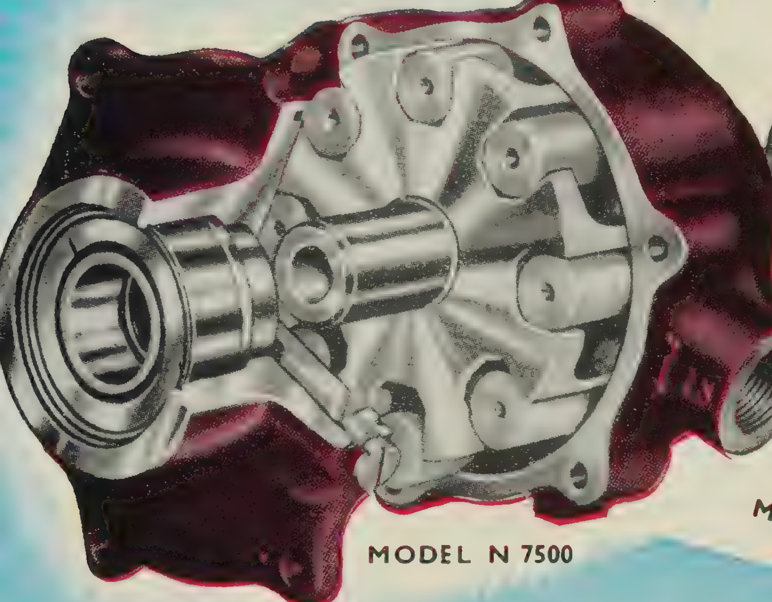

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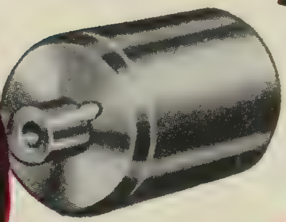

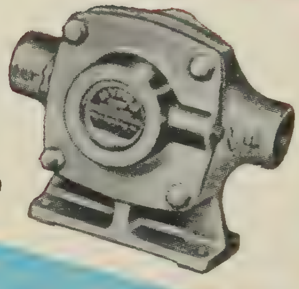

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HYPRO pumps will operate to give ample pressure to drive the spray material through the hair or wool so as to thoroughly drench the hide. Because stock spraying calls for the use of a wettable suspension material (Rotenone) the HYPRO roller design is ideal for long wear resistant service.

INSECT CONTROL

Both pumps have ample volume and pressure for insect spraying through either the boom type sprayer or cluster jet equipment. Use it to spray corn, vegetables, and for countless other crops that must be protected from insect pests by spraying.

GENERAL FARM USE

Spray barns for fly control ; flush out pig pens, poultry houses ; clean cattle trucks and other farm machinery. HYPRO pumps do all these jobs and hundreds more with volume and pressure to spare.

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HYPRO pumps are available in 2 models: N 7500 giving pressures up to 350 lbs. per sq. in., and the smaller model, N 6000, giving pressures up to 200 lbs. per sq. in. Also available, all auxiliary equipment such as Pressure Control Units, Guns, Booms, etc.

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Sowing the Seed

Spring (September or October) is the time for sowing. Generally in a 3ft.-wide bed 6in. bands separated by 6in. spaces are used. The bands are made with a 6in.-wide plank, preferably one thicker than 1in. This is laid along the bed 3in. from one edge and walked on. The plank is then placed 6in. from and parallel to the first band and again walked on. The process is repeated for the third band, which should have its outer edge 3in. from the other edge of the bed.

The seed is spread evenly in these bands. The aim is to space the crop 1in. x 1in. if the trees are to be lifted as yearlings or 2in. x 2in. if they are to stay in the bed for 2 years. It is therefore desirable to know the germinative capacity of the seed being sown. If it is not possible to obtain this before sowing, the following table will serve as a rough guide for the commoner species. It is, however, an average of numerous results, so that considerable variation can be expected for any particular lot of seed.

NO. OF SEEDLINGS FROM 1lb. OF SEED

Species	Seedlings
Radiata pine (*Pinus radiata*)	10,000
Corsican pine (*P. laricio*) ..	16,000
Ponderosa pine (*P. ponderosa*)	4,000
Macrocarpa (*Cupressus macrocarpa*)	7,000
Lawson's cypress (*Chamaecyparis lawsoniana*) ..	25,000
Douglas fir (*Pseudotsuga taxifolia*)	15,000
Larch (*Larix decidua*) ..	6,000
Western red cedar (*Thuya plicata*)	60,000
Eucalyptus botryoides ..	120,000
E. viminalis	1,000,000

The seed spread in the bands should be pressed into the soil by pressure on the plank used in making the bands. The seed is then covered with sieved soil or sand to a depth roughly twice the thickness of the seed. If the soil is inclined to cake, sand is very much better for this purpose.

Protecting the Bed

Better results are obtained in most parts of the country if beds are protected in the early stages against drying by sun and wind, against unseasonable frosts, and against loss of seed by mice and birds. Usually this protection is given by frames with side and end boards 6in. to 8in. wide over which is stretched coarse wire netting. This in turn is covered with open-mesh scrim, leafy branches, or slats held in place by wires stretched from end to end.

Such protection tends to produce conditions similar to those on the forest floor and at the same time stops loss from the activities of mice and birds. The result is a better strike and a bed which does not require watering except perhaps in an unusually dry spell.

Weeding is necessary throughout the period from the sowing of the seed to the lifting of the young trees. Certain hormone weedkillers are claimed to be safe for application among conifers, but they should be used with caution.

Later in the season the young trees have to be hardened off. This is done by raising one side of the frame for a short time each day, the period of exposure being increased gradually until the frames can be removed completely. The final removal should be reserved for a dull or a wet day.

Radio Broadcasts for Farmers during September

RADIO broadcasts for farmers will be given during September as follows:—

1YA Auckland, 7.45 p.m.

4 September—"Potato Growing", by D. M. E. Merry, Instructor in Agriculture, Department of Agriculture, Pukekohe.

11 September—Talk by officer of Animal Industry Division, Department of Agriculture, Auckland.

18 September—"Supplementary Cropping", by M. N. Walbran, Fields Instructor, Department of Agriculture, Pukekohe.

25 September—Talk by officer of Animal Industry Division, Department of Agriculture, Auckland.

1XH Hamilton, 12.33 p.m.

9 September—'Hygienic Milking and the Control of Mastitis", by G. R. Mackintosh, Livestock Instructor, Department of Agriculture, Hamilton.

16 September—"Spring Problems on the Dairy Farm", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

23 September—"Some Observations from Overseas", by D. J. Carter, Federated Farmers, Hamilton.

30 September—"Weed Control", by F. B. Thompson, Agricultural Chemist, Department of Agriculture Rukuhia Soil Research Station.

2XG Gisborne, 8 p.m.

3 September—"Stockowners' Question Time", by E. B. Smythe, Livestock Instructor, Department of Agriculture, Gisborne.

1YZ Rotorua, 7.15 p.m.

4 September—"Hydatid Disease and its Control", by K. G. B. Wilson, Livestock Instructor, Department of Agriculture, Opotiki.

18 September—"Summer Cropping", by G. A. Blake, Instructor in Agriculture, Department of Agriculture, Matamata.

18 September (12.33 p.m.)—"Fitting Your Pig Production to Your Seasonal Milk Supply", by H. Preston, Supervisor, Rotorua District Pig Council.

2XA Wanganui, 8 p.m.

5 September—"For the Country Woman", by Mary MacDonald.

12 September—"The Radio Vet.", by S. Jamieson, Veterinarian, Department of Agriculture, Wanganui.

19 September—Pig production talk, by C. M. Bailey, Supervisor, Taranaki District Pig Council.

26 September—"Silage", by A. K. Booth, Instructor in Agriculture, Department of Agriculture, Wanganui.

2ZA Palmerston North, 12.33 p.m.

2 September—"Meat Inspection", by C. A. Hercus, Meat Inspector, Levin Abattoir, Levin.

9 September—"Growing Peas for Seed", by W. B. H. Smith, Fields Instructor, Department of Agriculture, Masterton.

16 September—"Fertilisers, What to Use", by G. N. Paulin, Horticultural Instructor, Department of Agriculture, Palmerston North.

23 September—"Hard Seed in Legumes", by A. V. Lithgow, Officer in Charge, Department of Agriculture Seed-testing Station, Palmerston North.

30 September—"Mechanisation of Silage Making", by J. O. Brasell, Farm Machinery Instructor, Department of Agriculture, Palmerston North.

2YZ Napier, 7.10 p.m.

10 September—"Soil Erosion", by J. L. Porter, Soil Conservator, Department of Agriculture, Hastings.

24 September—"Development of Hawke's Bay Hill Country", by F. H. Collin, Instructor in Agriculture, Department of Agriculture, Hastings.

3YA Christchurch, 12.20 p.m.

2 September—"Latest Development in Vegetable Growing", by R. G. Heasley, Horticultural Instructor, Department of Agriculture, Christchurch.

16 September—Review of "The New Zealand Journal of Agriculture" (September issue), by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.33 p.m.

2 September—"Wool Handling", by W. J. Hansen, Sheep and Wool Instructor, Department of Agriculture, Dunedin.

9 September—"Strawberry Culture", by W. G. Crawford, Horticultural Instructor, Department of Agriculture, Oamaru.

16 September—"Poultry Hygiene", by M. E. Sutton, Poultry Instructor, Department of Agriculture, Dunedin.

23 September—"Crops for Spring Sowing", by H. A. Duff, Fields Instructor, Department of Agriculture, Dunedin.

30 September—"Recent Research in Bloat", by I. M. Cairney, Veterinarian, Department of Agriculture, Dunedin.

4YZ Invercargill (following joint programme from 4YA and 4YZ):

2 September—"Drainage", by I. F. Falconer, Drainage Advisory Officer, Department of Agriculture, Invercargill.

9 September—"Pig Meat", by F. D. Usher, Supervising Meat Inspector, Department of Agriculture, Makarewa.

16 September—"Topdressing of Tussock Grassland", by T. G. Sewell, Instructor in Agriculture, Department of Agriculture, Gore.

23 September—"Mammitis in Ewes", by R. G. Buchan, Livestock Instructor, Department of Agriculture, Gore.

30 September—"Farm Development in Northern Southland", by G. W. Nixon, Instructor in Agriculture, Department of Agriculture, Invercargill.

◆

Care of Livestock during September

Contributed by the Animal Research Division

CARE OF EWES WITH TWIN LAMBS

FOR the first month or 6 weeks of life the lamb depends almost entirely on its mother's milk. Ewes are capable of producing more milk than a single lamb can drink in the early part of lactation. Twins, on the other hand, can soon drink all the milk which the ewe can produce. For this reason ewes with twin lambs should be drafted off and grazed together on good paddocks. Separation is most easily done immediately after lambing.

ROTATIONAL GRAZING OF CALVES

Over 10 years at Ruakura well-reared heifers have outproduced their poorly reared mates by an average of 21lb. of butterfat in the first lactation when both were well fed after calving. Frequent changes to good, clean pasture are essential if calves are to be successfully reared. This rotational grazing avoids deaths in winter, eliminates the need for drenching against worms, and produces yearlings 100lb. heavier than those kept in the one paddock for weeks at a time. Further information on the good rearing of dairy stock is contained in Department of Agriculture Bulletin No. 228, "Good Rearing of Dairy Stock".

FEEDING THE MILKING HERD

Autumn-saved pasture is almost equal to high-quality spring pasture as a milk-producing fodder. It should, therefore, be rationed to the milking cows to make it last until the spring feed comes away and hardens up. An electric fence is essential for efficient utilisation of autumn-saved pasture enabling it to be grazed in small breaks. Unless sufficient reserves of this pasture are available for full feeding, the balance should be made up with silage. Make sure enough hay is retained to balance the lush spring growth.

When the autumn-saved pasture is finished the herd should be rotated round the farm. Paddocks should be small enough to maintain a concentration of 20 to 30 cows per acre. If necessary, larger paddocks should be subdivided with the electric fence. Aim at grazing pasture when it is 4in. to 6in. high, as it is then at its most nutritious stage. Do not keep cows for more than 1 or 2 days in the paddock. If necessary, clean up after them with dry stock.

CARE OF PIGS

Late-farrowed spring litters should receive special attention, since these will be approaching weaning age. Creep feeding is the secret of the heavy weaner, and best results will be obtained by having a supply of meal and milk always before the litter. Weaned pigs must be well fed and, if meal has been used before weaning, its use should be continued for at least a fortnight to avoid an after-weaning check. The meal ration can be reduced as the skimmed milk supply increases. It is preferable at this stage to feed meal to weaners as up to half their daily rations and give the milk saved to the store pigs than to feed meal to the older pigs.

After weaning, sows should receive sufficient milk and meal to enable them to regain the weight lost during previous suckling. They should be hand mated, and once safely in pig may be allowed to subsist on good pasture.

VACCINATION AGAINST SCABBY MOUTH

On farms where scabby mouth occurs each new crop of lambs should be vaccinated. This is done most conveniently at marking. If lambs are not protected, they are liable to suffer a severe check, as the disease makes eating very painful. The vaccine gives very good protection if properly used. Care is necessary to keep the needle prong clear of grease; if it becomes blocked, no vaccine is applied and lambs may still be susceptible. Ewes which have not previously been exposed to the disease should be vaccinated at the same time as their lambs.

MASTITIS

Mastitis is usually most prevalent in spring. Milk from all quarters should be carefully examined each day in a strip cup. If there is any abnormality, treat the quarter without delay, using three tubes of penicillin cerate at 24-hour intervals. Prompt treatment at this time of the year will greatly reduce loss in production from light or dry quarters.

COCCIDIOSIS IN POULTRY

To prevent coccidiosis in chickens it is necessary to keep them growing steadily. Any check is dangerous. Cleanliness is very important, as the disease spreads through the soiling of food by droppings. If an outbreak occurs, sulphamezathine or sulphaquinoxaline should be used in the drinking water. Full particulars of dosages may be obtained from Department of Agriculture Poultry Instructors.

X CHICK DISEASE

The work carried out on X chick disease has shown it to be a form of vitamin E deficiency, possibly arising from feeding certain batches of wheat. So far outbreaks of X chick disease have been confined to the South Island, and poultry farmers in the areas affected in previous years are advised to add 5 per cent. of wheat germ meal to the chick mash as a precautionary measure.

An article describing the results of the investigation carried out on this disease appeared in the September 1958 issue of "The New Zealand Journal of Agriculture".

Spring Topdressing and Pasture Management

Seasonal Notes by the Extension Division

SPRING TOPDRESSING AND SPRING PASTURE MANAGEMENT ON DAIRY FARMS

BREAK GRAZING should be continued into spring to obtain maximum utilisation of pasture and therefore enable the earlier closing up of surplus feed for silage. Paddocks to be cropped can be punished by hard grazing, first by milkers and then by dry stock.

Late spring topdressing in addition to autumn applications will increase summer feed and production will be maintained further into summer. Paddocks closed early for silage benefit from an extra dressing after being cut; those closed later and the hay paddocks can be topdressed when first shut up. Pastures sown last autumn should be topdressed again in spring.

Only grass surplus to the requirements of the herd should be saved for silage. A small part of the paddock closed can be grazed 3 weeks later, and if cut last, this younger more sappy growth can be used to cap and seal the silage. The pit or trench, the bun, and the wedge in order of preference result in the least waste of material ensiled.

—J. F. TILL

* * *

SPRING PASTURE MANAGEMENT IN THE SOUTH ISLAND

ON mixed farms in the South Island the farmer who is making the most efficient use of his land with stock and crops frequently finds early spring a difficult time to make the best use of available pasture. A straightout sheep or dairy farmer has only two considerations at this time—the feeding of paddocks by stock and the saving of some paddocks for silage and hay. The mixed farmer has to consider also which paddocks to plough for later spring crops and which paddocks he will save for grass and clover seed. Generally it is not until this time of the year that a decision can be made about paddocks which are doubtful as white clover crops. Where it is apparent that suckling clover and other weeds are going to make white clover harvesting a doubtful proposition the paddocks showing such indications can be turned over for peas or barley. Stock may be concentrated on such paddocks, thus making full use of available feed before ploughing. If lucerne is being grown on the mixed farm, there is no need for the farmer to worry about which paddocks should be shut up for hay or silage, but he can concentrate on grazing the best ryegrass and white clover paddocks so that they give the highest seed yields. White clover seed areas should receive reasonably close grazing until late October or November. Closing too soon will allow the grasses to get away. On the other hand the ryegrasses for seed crops should be allowed to produce leaf, and grazing should be maintained at about 1½in. to 2in. until time for closing, from September to November, depending on locality. Cowgrass areas should be grazed before they are shut up in October to produce hay in December and a seed crop in autumn. Montgomery red clover is also usually shut up in November to December. Sufficient grass paddocks will also have to be reserved as grazing areas during the period that grass and clover crops are shut up.

—P. R. BARRER

* * *

HILL COUNTRY WATER SUPPLIES

NOW is the time to give some thought to the provision of plenty of clean water for livestock on hill country, especially where stock numbers have been increased as a result of topdressing and oversowing, and new subdivisions have been made. The success of the deep water-storage ponds made with the bulldozer, which were described in an article in the November 1956 issue of the "Journal" is due to the siting of the ponds well up the hills and to the method of construction which aims at prevention of loss of water by evaporation and seepage. It is surprising how small a catchment area is needed even in a relatively low rainfall area to keep these ponds operating as permanent sources of water where it is most needed. Where the subsoil is pervious this method of water storage cannot be used, but springs are often present on the lower slopes of such country and the collection of water seepage from these, by means of tiles leading into a pipe to a water trough, has proved to be another satisfactory way of providing a better water supply on this country. The tiles are put in in the form of a bow across the seepage area below the spring and in addition to collecting all the water available they serve also to drain the area, changing boggy places to dry land.

—J. M. BRASELL

* * *

WEED CONTROL IN CEREAL CROPS

BY late August or early September most weeds which are likely to be troublesome in autumn-sown cereal crops are already beginning to be noticeable. Harrowing of autumn-sown cereal crops at this time is a useful way of controlling annual weeds which have germinated in late winter to early spring. However, in recent years hormone weedkillers have proved extremely effective in killing annual weeds in the young stage and also in controlling Californian thistle. Annual weeds which are readily killed and which are often of economic importance at a later stage are wild turnip, tares, hedge mustard, fat-hen, and shepherd's purse.

The most suitable general-purpose spray is the salts or amines of MCPA at 1lb. per acre. MCPA is preferable to 2,4-D as the latter sometimes causes a slight reduction in grain yield. The best time to spray is generally at about the 6in. to 8in. high stage, when the plant has fully tillered. This is most important, as yields may be reduced if spraying is carried out too early, or if it is left too late, germination injury may result. Apart from the general disadvantages of low germination for seed purposes, malting barley loses its quality if the germination is low.

Some cereal growers claim that the most effective way of getting rid of Californian thistle on heavy land is by spraying in two successive years in cereal crops. Spraying for Californian thistle still should be done at the same stage of growth of the wheat crop as above, though to cause a more severe check to the Californian thistle a later stage is better. MCPA is the most effective preparation to use.

NITROGEN TOPDRESSING FOR GRASS SEED AND CEREALS

In early September autumn-sown wheat which has suffered a check through wet weather and is looking unthrifty and yellow frequently gives a good response to a dressing of 1cwt. of sulphate of ammonia applied at this time. The vigorous growing, dark green crops do not respond. The majority of ryegrass and cocksfoot seed crops will give an increased yield for a dressing of 1cwt. or if very yellow 2cwt. of sulphate of ammonia or other nitrogenous fertiliser. On country where there is a sulphur response sulphate of ammonia may result in excessive clover growths. On the other hand it may be preferred if the clover is weak and it is intended to encourage it for the following year. The time to apply nitrogenous fertilisers for ryegrasses is when the paddock is finally shut up from stock. For cocksfoot, spring is the best time. It should be emphasised that nitrogen topdressing will not convert a weedy cocksfoot crop into a good one.

—P. R. BARRER

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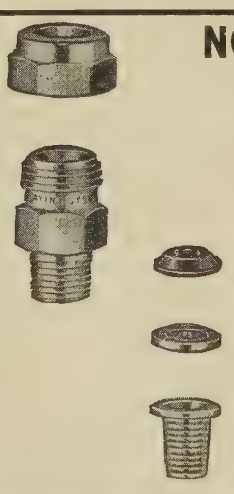
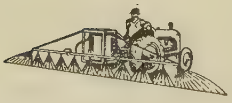
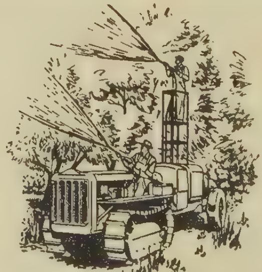




BOOM
SPRAYING

BROADCAST
SPRAYING



HAND SPRAYING

AIRPLANE
SPRAYING

PASTURE RESEARCH IN GREAT BRITAIN

OF the many important differences between grassland farming in New Zealand and in Great Britain two deserve special mention: The first is the much greater severity and length of winters in Britain. In practically all districts pasture growth ceases completely for several months in winter and makes slow recovery in spring. This spring growth is often acutely nitrogen deficient, mainly due to a deficiency of vigorous clover, which is not really productive and releasing nitrogen to associated grasses until summer. A second important difference is the high percentage of short-term pastures. Cropping both for cash crops and for supplementary fodder crops is on a much more extensive scale than in New Zealand and pastures of 1 year to 4 years of age dominate the grassland of ploughable country. Large areas of fodder crops must be grown to supplement pasture production during long periods when pasture is dormant.

P. B. Lynch, Crop Experimentalist, Department of Agriculture, Wellington, the author of this article, presented a paper at the International Congress of Soil Science in Paris in 1956 and visited many of the principal British agricultural research establishments.

DESPITE these differences New Zealanders can learn much from British grassland workers. Such knowledge may have special application in some of the colder and more difficult-to-farm parts of New Zealand.

Ryegrasses

The winter of 1955-56 was exceptionally severe in Britain and there were widespread complaints of winter killing of New Zealand short-rotation ryegrass. This has caused considerable interest in the S22 strain of Italian ryegrass bred by the Welsh Plant Breeding Station, Aberystwyth. This strain has given good early spring production ("early bite"), especially when manured with nitrogenous fertilisers.

Work with a range of special late-flowering ryegrass strains at the Grassland Research Institute, Hurley, was particularly interesting. Some of these strains have a longer productive grazing period and may be worth trying in districts such as Southland where perennial ryegrass rushes to seed in November and the lamb-fattening capacity of such pastures is seriously reduced as a result.

Need for Caution

THE information in this article was gathered in 1956 in the course of a tour of agricultural research stations of the British Isles, from visits to a number of farms, and from discussions at the summer meeting of the British Grassland Society at Hereford. It must be stressed that farmers in New Zealand would be wise to await the results of testing of the pasture species and the pasture-management techniques that are mentioned before applying them in this country.

The English practice is to sow a range of strains, particularly of ryegrasses, in seed mixtures. One of the objects in so doing is to extend the length of the productive season. Another is to make more certain that one at least of the strains sown will fit in with the soil and management practices of the sward in question. New Zealand practice differs sharply from this, and seeds mixtures are, in general, much simpler than in Britain. A ryegrass-white clover seeds mixture for "long-duration grazing leys" as recommended by the British Ministry of Agriculture, Fisheries and Food is as follows:—

	Lb. per acre
Perennial ryegrass:	
Certified S24	8
Certified S23	4
Certified S101	4
White clover, certified S100 ..	1½
Wild white clover, certified S184	½
	18

The S strains identify lines bred by the Welsh Plant Breeding Station, Aberystwyth. **S24 ryegrass** was bred from English and Hawke's Bay (New Zealand) seed and is, perhaps, most near in type to New Zealand pedigree strain. It is early in spring and about mid-season in flowering. It may be less persistent than some other strains under hard grazing.

S23 ryegrass was developed primarily from some very old-grazed pastures in Wales, but other English types were included in its breeding. It is late-flowering, high-tillering, dense, and leafy, but is rather late in producing in spring. It is not as productive as some of the other strains. **S101 ryegrass** on the other hand is not quite as late flowering as S23, and the plants are bigger and leaf blades are larger and generally more of an erect hay type.

Of the two white clover types in the mixture given, S100 is large leaved and more like New Zealand pedigree strain. S184 is smaller leaved, dense, and highly persistent under close grazing.

Perhaps more work could be done in New Zealand in the sowing of mixtures of various strains of pasture species, though obviously this would be out of the question in seed-producing areas.

Meadow Fescue

There are many enthusiasts in England for meadow fescue. Two Aberystwyth strains are available: S53, which is primarily a pasture type and rather more dense than S215, the "pasture hay" strain. Meadow fescue is commonly sown with timothy for 3- to 4-year leys. Most of the timothy-meadow fescue pastures seen were vigorous in growth but lacked density.

Some very high production figures have been secured from timothy-meadow fescue pastures, though they are slow in establishing. They seem to be more suited to dairying and to cutting for silage or dried grass. Two virtues are continued palatability despite lax grazing and ability to withstand severe winter conditions.

New Zealand experience with meadow fescue has not been very encouraging, as it is generally very slow to establish and suffers from weed competition in the early life of the sward. Generally meadow fescue does not produce as much as perennial ryegrass, except possibly in early summer, when ryegrass has seeded and meadow fescue is still making leafy growth. Experimental work with this grass is continuing, however.

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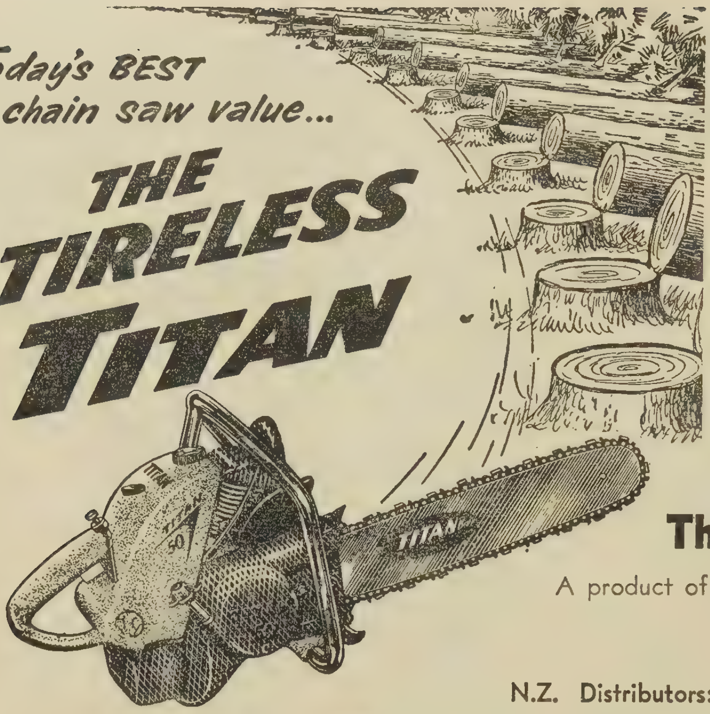

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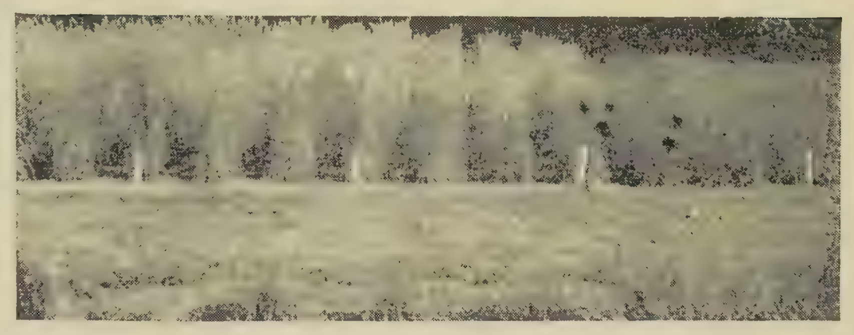
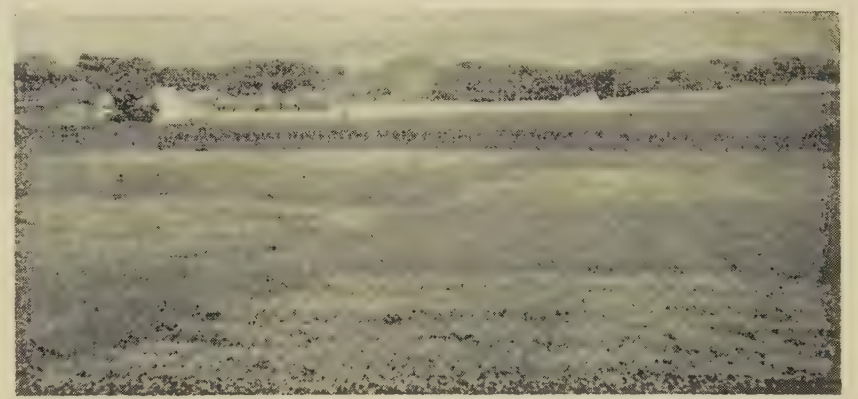


Plots at the Welsh Plant Breeding Station, Aberystwyth, of bred timothy strains with different times of maturity as shown by differences in stage of flowering.



▲ Timothy strains trials with various rates of nitrogenous topdressing at the Grassland Experimental Centre, Muchalls, Aberdeen. The plots without white clover have been dressed with heavy rates of nitrogenous fertiliser.

Meadow fescue has been used successfully as a companion grass with lucerne. It cannot be sown with perennial ryegrass, as it is unable to compete with that species in the sward.

Tall Fescue

To a New Zealander, accustomed to regard tall fescue as a dangerous weed, it comes somewhat as a surprise to find quite an interest in this grass for grazing. It has special merit for winter hardiness and productivity. Aberystwyth has developed a strain of tall fescue, S170, which seems quite palatable to cattle and highly productive. No place visited reported any toxic effects on stock from grazing of tall fescue.

Tall fescue in a pasture sward is, however, a very different proposition from the rank clumps of tall fescue infesting swamp lands in places such as the Manawatu. It is being tried with some success in low-rainfall areas in New Zealand, such as Central Otago, and may have a place on such country.

Timothy

Breeding work at Aberystwyth with timothy aims at securing winter hardiness, early spring growth, and rust resistance. A range of strains with different maturity dates has been developed with the aim of extending the productive season of timothy. Timothy is widely sown in general-purpose seed mixtures and also for special pastures, particularly in association with meadow fescue. It has been used successfully for winter grazing and is productive and palatable over winter.

Pasture of S170 tall fescue and white clover at the Welsh Plant Breeding Station, Aberystwyth.

In Scotland some of the quicker maturing commercial Swedish and Scottish strains of timothy are preferred to Aberystwyth strains, owing to their earliness and greater bulk of production in the first few years. In rigorous climates with a short growing season it seems more important to have a species capable of responding rapidly to good growing conditions than to aim for length of productive season.

Aberystwyth strains of timothy have been tried in New Zealand, but show no special merit over New Zealand-bred strains. As new strains are developed, however, they will require testing in various localities.

Cocksfoot

Cocksfoot is highly regarded in Great Britain for winter production and ability to withstand grazing throughout winter. For this purpose sowing in rows has been found to give less waste and higher carrying capacity than broadcast sowing.

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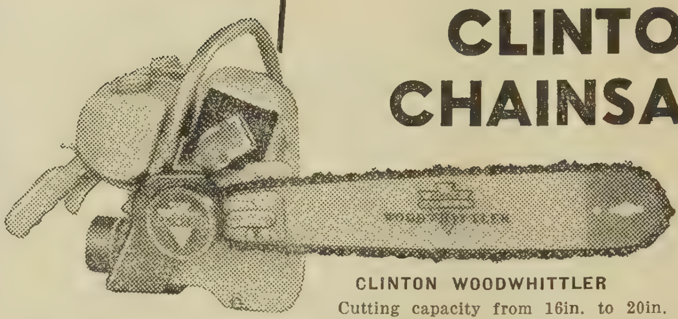

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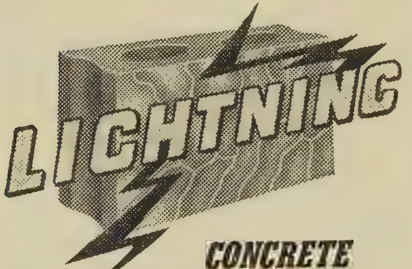

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Effects of leys on soil fertility are being studied in these trials at Rothamsted Experimental Station, Harpenden, England.

The winter "foggage" typical of pastures saved for winter grazing is, however, much removed from the well-controlled, leafy, winter-saved pastures of New Zealand. It is more in the nature of a standing hay crop and cocksfoot is particularly suitable for use under these conditions. Some particularly winter-hardy strains were impressive and may be worth trying in some of the high country in New Zealand.

Effect of Clovers on Grass Production

In Britain there is widespread interest in, and research into, the nitrogen-supplying powers of clovers in a mixed sward. Most British research workers agree that vigorous clover growth will supply the equivalent of 8cwt. to 10cwt. of sulphate of ammonia per acre a year, and the use of lower rates of fertiliser merely replaces some of the clover nitrogen with "artificial" nitrogen. (This does not apply to the use of nitrogenous fertiliser for out-of-season growth when clovers are not growing vigorously.) Extra pasture production can, however, be secured from the use of artificial nitrogen above 10cwt. per acre up to a maximum of about 1 ton per acre of sulphate of ammonia equivalent.

Work at the Grasslands Division, Department of Scientific and Industrial Research, places the nitrogen-supplying power of clovers several times higher than the British figure.* This clearly reflects the different length of growing season of white clover in New Zealand and Britain.

Hereford cows and calves at Kinsham Farm near Hereford, England.

Effects of Leys on Soil Fertility

Practically every appropriate research station in Great Britain has a trial or trials with a complicated series of crop rotations. These experiments evaluate the effects of different types and lengths of leys (pasture in a cropping rotation) on soil fertility, this being measured by the yields of crops in the rotation. Type of pasture and length of leys unquestionably have a marked effect on crop yields, much of which can be traced to the effect on the nitrogen status of the soil.

Under typical farming systems on arable land in England about 50 per cent. of the farm area is under crop, and work on the effects of duration in pasture and of type of pasture on subsequent crops is of considerable practical importance. In New Zealand, where intensity of cropping is usually much less, the type of pasture ploughed under is probably more important than the length of the ley. It was interesting to see work in England which confirmed the findings that good pastures were necessary for high-producing crops.

Quality of Grassland

It is easy to form a false impression of the standard of grassland farming in Great Britain. Pastures considered to be first class by New Zealand standards are by no means common and there appears to be less appreciation of the potentialities of good pasture. Pasture-management practices are very often of the type that leads to depletion of fertility and a clover-deficient, nitrogen - starved sward. A common practice is to cut first-year pastures for hay to the detriment of the swards.

Apart from nitrogenous fertilisers, which are used much more extensively and heavily than in New Zealand, many pastures seem to receive inadequate fertiliser—a position that contrasts strongly with the liberal use of fertilisers on crops. But fertiliser use is governed by a short growing season (and consequently a need to produce far more hay and silage per unit area than in New Zealand), and a much greater intensity of cropping.

Thus the number of stock-grazing days on each acre of grass is much below the average for New Zealand. This is reflected in a greater drain on soil fertility, a drain, particularly of nitrogen, which is not helped by a short productive season for clovers. It is from the progress that has been made in overcoming these difficulties that New Zealand can draw useful ideas for application to some of its grassland problems.

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* P. D. Sears and L. T. Evans: "New Zealand Journal of Science and Technology", vol. 35A, supplement 1 (1953).

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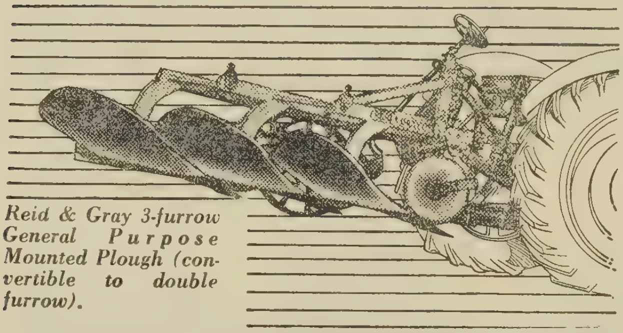

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Work in the Home Garden in September

By A. G. KENNELLY,
Horticultural Instructor, Department of Agriculture, Dunedin

SPRINGTIME is seed sowing time and in most gardens much seed sowing is usually done in September. Even in the colder districts the ground is warm enough for the seed of hardy plants to grow satisfactorily. In a few specially favoured districts even frost-tender plants such as dwarf and runner beans, cucumbers, pumpkins, marrows, and squash can be sown outside, but it is important to remember that the soil should not be worked or walked on if it is wet.

THOUGH generally the most important work is seed sowing, the setting out of plants raised from seed sown earlier will also be important in many gardens. The setting out now of well-grown and hardened plants raised under glass is the only way by which home gardeners in some districts can avoid the break in continuity of supply which is liable to occur after the finish of early spring crops which were set out in autumn or winter.

Early or late in September, according to the district, tomatoes, celery and celeriac, peppers, egg plants, melons, and cucumbers can be sown under glass. However, in most southern districts or where the last killing frost may occur as late as the first or second week in November there is no hurry yet to sow seed of cucumbers, marrows, pumpkins, and squash for growing outdoors. Seed of brussels sprouts, leeks, and cauliflowers can be sown in most districts in the open.

Seedlings of silver beet, lettuce, summer cabbage, and cauliflower can be set out or gaps can be filled in earlier planted crops. Early planted potatoes will need protection from frost, and a successional planting can be made. Except in favourable situations the planting of the main crop is best deferred until the first or second week in October.

Tubers of Jerusalem artichokes can still be set out. In exposed situations broad beans may require support, which can be provided by strings tied at suitable heights to stout stakes placed at 5ft. to 6ft. intervals along the sides of the bean rows.

In many districts peas will need protection from birds. Wire netting guards or cotton stretched over the rows are effective, though a dusting of lime, superphosphate, or sawdust or similar substance is occasionally satisfactory.

Shelter for Early Crops

During September and October the greatest benefit can be obtained in most gardens from shelter such as is provided by planting on the sunny, sheltered side of a wall, fence, or trellis. Advantage may be taken also of shelter such as a low hedge or even hardy, established crops such as broccoli or double or treble rows of broad beans.

Generally, semi-permeable or partly open shelter such as lattice work is more satisfactory in providing shelter over a considerable area of the garden than is shelter such as a solid fence. Such a fence may give almost still conditions close to it in strong winds, but may cause damaging turbulence a short distance away.

Plant Protectors

Good use can be made of cloches and frames and of special plant protectors or caps of waxed, bleached paper or linen. Plastic film, too, is specially useful. Even the very thin gauge plastic film which is made up into containers for fruit and vegetables and widely used in shops can be used in the production of early crops. Plastic film is now fairly generally available in long sheets of up to about 40in. wide and in different thicknesses.

The finer gauges of plastic film are transparent and the heavier opaque, but any of it can be made up into squares or rectangular sections for frames, lights, or cloches of various types, some of which are illustrated on page 140. The material may be used in place of glass in a glasshouse.

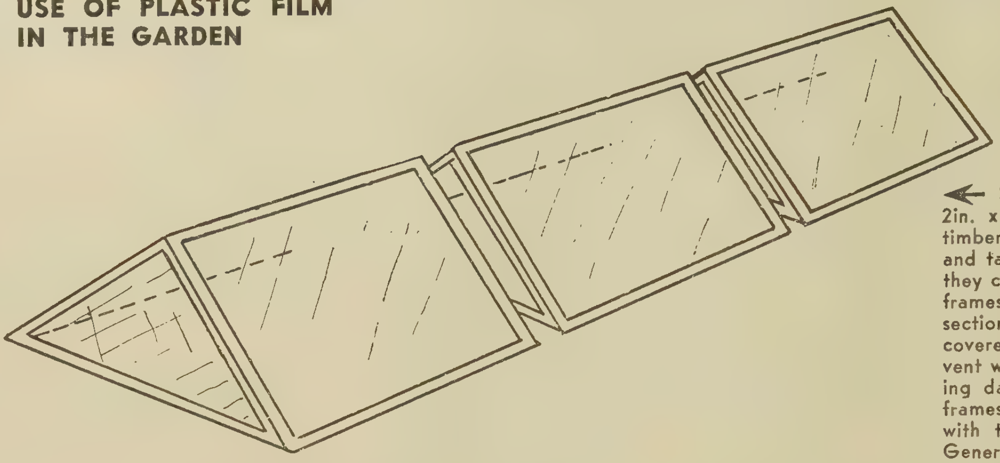
A few trials are at present being carried out in New Zealand with plastic film on glasshouses and frames. Overseas experience indicates that high light intensities weaken the film. In New Zealand it has been used successfully for 18 months and still appears sound. In fixing the film to any structure it is important not to staple the film close to its edge, as if this is done, it tends to tear away. A good practice is to fold the plastic near the edge and staple through the two thicknesses.

Asparagus

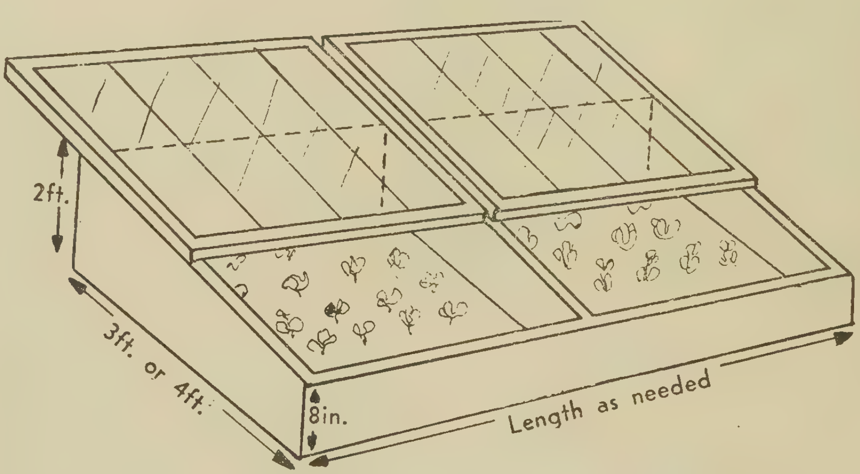
Established asparagus beds should be kept weed free and, if the soil is poor, may be fed with liquid manure made from organic material such as farmyard or poultry manure. Alternatively nitrate of soda or sulphate of ammonia at 1oz. to 2oz. a square yard is likely to give good results. Dried blood can be used, but on light, sandy soils lacking in organic matter late dressings of dried blood sometimes give a rather musty flavour to the shoots when cooked.

It is not too late to plant new asparagus beds, particularly in the south, but no time should be lost, as the young seedlings may be checked. The ground should be prepared by being deeply dug and cleared of weeds. Good drainage is essential and field drains should be installed if the condition of the ground warrants their use.

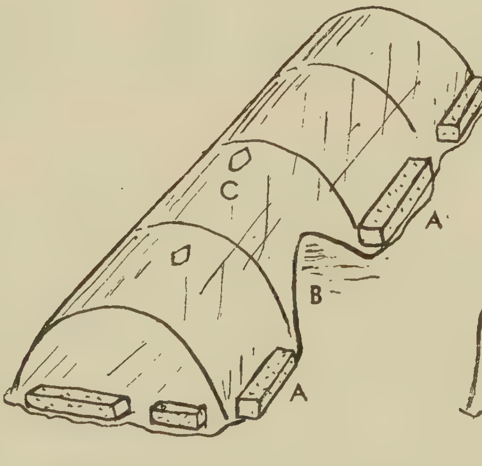
USE OF PLASTIC FILM IN THE GARDEN



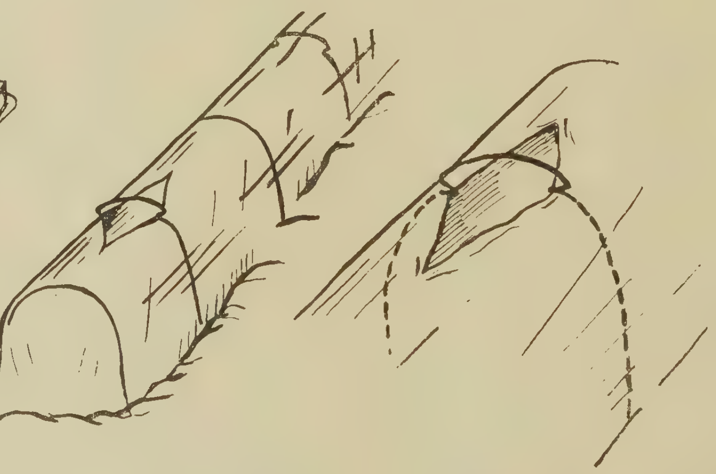
Simple frames made of 2in. x ½in. battens or similar timber over which is stretched and tacked plastic film so that they can be used as cloches or frames. The ends of the end sections in a row should be covered with plastic to prevent wind getting in and causing damage. The size of the frames can be in accordance with the crops to be grown. Generally frames covering 3ft. x 2ft. are satisfactory.



Frame for early production, raising seedlings, or growing half-hardy or tender plants. It should face north. The back should be considerably higher than the front to allow water to drain off the covering lights and, in a north-facing frame, to admit sunlight. Strands of wire support the plastic. These can be 1ft. apart if the lights slope enough to shed rain. If the slope is steep, wire support is not needed. The frame lights can be made of 2in. x 1in. or 1½in. timber with plastic film stretched tightly over it and supported by the wires.



Low cloche formed by covering bent heavy-gauge wires with plastic film. Bricks, stones, or lengths of timber (A) hold the plastic down. Ventilation holes are provided by clipping the plastic back at the edges with paper clips (B) or clipping out pieces (C).



Another method of using plastic over heavy-gauge wire. Alternate hoops are bent as shown so that ventilation can be provided by slitting the plastic and pulling it out into the bends in the wire. Alternatively all the hoops can be bent to the shape of an inverted U and paper clips used to hold back the plastic at the ventilation openings. The plastic can be weighted down at the edges or buried a few inches in the ground.

Though asparagus succeeds in light soil deficient in organic matter, young plants establish better in beds that have been dressed with well-rotted organic matter some time before planting. One-year crowns are best. Plants should be set out as advised in the June "Journal".

Beetroot

Detroit Dark Red is a good variety of beetroot for sowing now. The danger of the crop developing a high percentage of premature seed heads owing to too prolonged low temperature is now past.

Beet does well in ground that was heavily manured for a previous crop, but a complete fertiliser is likely to give the best results on most soils, because it has been shown that fertiliser that produces the highest yield of beet also produces the most succulent roots. Such roots lose their succulence more slowly after harvesting than do roots of unfertilised plants or roots of plants fertilised with material containing only a single element such as nitrogen, phosphorus, or potash.

Beetroot usually responds best to neutral or slightly acid soils. On alkaline soils roots are often scabby.

Lack of good colour in beetroot (and silver beet) is usually due to lack of nitrogen, and this may be corrected by applying nitrate of soda, sulphate of ammonia, or dried blood at about 1oz. to the square yard. Common salt often improves growth and texture of beetroot.

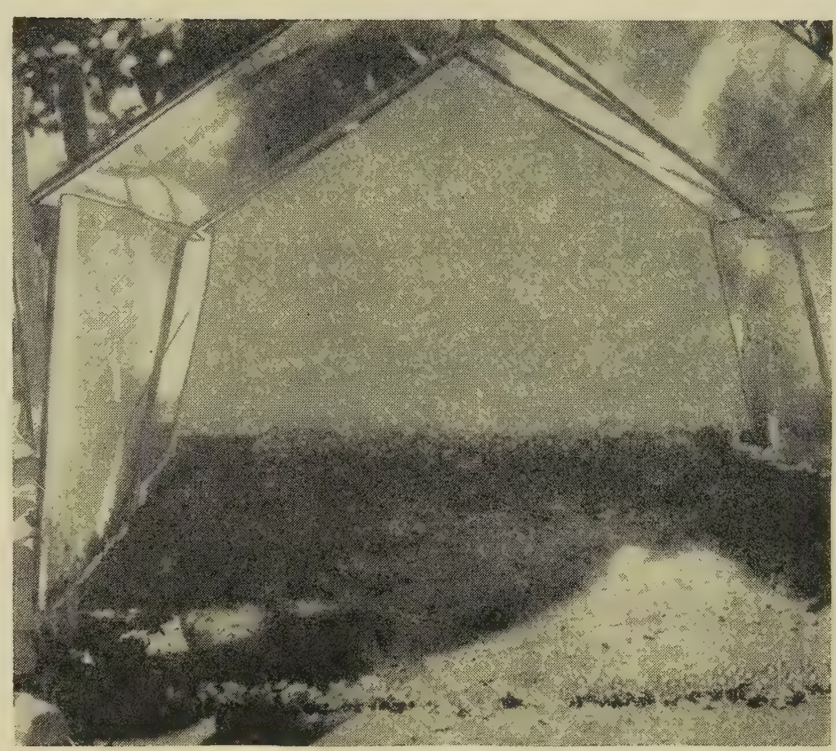
Sowing

Rates of sowing for beetroot vary according to the quality of the seed, the variety, and the purpose for which the crop is intended, but as beet "seed" is a fruit containing from 2 to 6 seeds, each of which may develop into a plant, sparse seeding is usually desirable. Rates of sowing vary from about 1oz. to 3oz. per 100ft. of row.

In most home gardens, where the percentage of germination is unpredictable, owing to either seed or soil condition, 10 to 15 seeds per 1ft. of row usually gives satisfactory results. Seed should be sown in rows 12in. to 18in. apart according to the size of the tops of the mature plants and about ½in. deep in heavy soils and up to 1in. deep in light soils.

Seedlings will usually have to be thinned to produce the best crops. The first thinning should remove the excess from groups of seedlings that have arisen from a single "seed". Additional thinning may be necessary later and the young plants thinned can be used as greens. Beetroot seedlings transplant well when small and the area of crop can be increased by transplanting.

Silver Beet, Spinach Beet, Spinach



In cool weather seedlings usually grow quite well under a cloche.

Leaf beets and spinach are health-giving vegetables worth a place in practically every home garden. Silver beet or Swiss chard differs from spinach beet in its upright habit of growth and large leaves, which have broad, white or whitish midribs. Spinach beet is sometimes called perpetual spinach (beet) and is a form of silver beet with smaller leaves which arise from a crown. It is one of the most useful of the leaf beets, because unless conditions are very hot and dry, it will continue to develop leaves which can be plucked for many months.

Spinach is less enduring than silver or spinach beet under hot summer conditions. It is quicker maturing, however, and in the moist, relatively cool weather of spring, varieties of it will mature in good soil conditions in from 40 to 55 days.

The soil for all three vegetables should be moist, fertile, well cultivated, and well drained. Lime at 2oz. to 3oz. per square yard should be applied to soils not recently dressed, and a good dressing of organic material such as well-rotted farmyard or stable manure in addition to a complete fertiliser is advisable on many home garden soils.

Seed should be sown about ½in. deep in rows 12in. apart for spinach and spinach beet and 15in. to 18in. apart for the upright-growing leaf beets. Any of the varieties of leaf beet can be sown now, but it is advisable to choose a variety of spinach which is fairly tolerant of warm conditions.

Carrots

Seed of carrots should be sown as soon as soil conditions are favourable. In most home gardens several small successional sowings are preferable to one large one. Carrots are high yielding and grow well in deep, rich, well-drained and well-cultivated soils that contain adequate well-rotted organic matter.

When seed is sown thinly on light, free-working, sandy loams or peat soils carrots do not usually require thinning. Where thinning is necessary it can often be delayed with advantage until the plants are large enough to be used in soups, salads, or stews.

Though carrots thrive in deep, rich, well-drained, well-cultivated soils, care should be taken when building up the humus content to apply only well-rotted material in limited quantity so that when it is incorporated it forms a homogeneous mass with the soil; otherwise misshapen or forked roots may result. Manure should be well rotted and the best results are usually obtained from planting in ground that was heavily dressed with organic manure for the previous crop.

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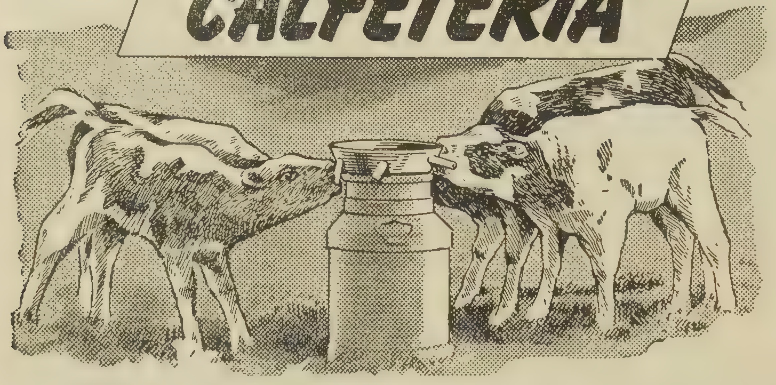

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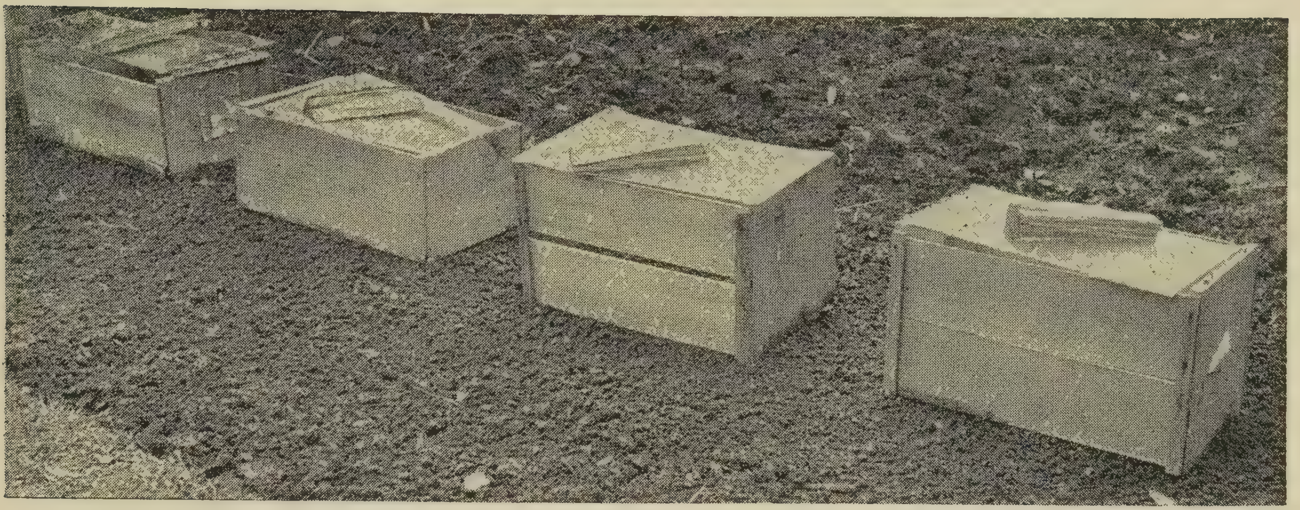

[*Sparrow*

Boxes with the bottoms out and covered with glass or plastic can be used to give protection to seedlings or early crops.

all soils, but on most soils reasonably well supplied with organic matter, a complete fertiliser dressing should be applied at about 2oz. to 3oz. per square yard. Though carrots are fairly tolerant of moderately acid conditions, a deficiency of lime can be remedied on most soils by the application of 2oz. to 3oz. of agricultural lime per square yard.

To ensure that germination is good the seed-bed should be worked down to a fine tilth. Seed should be sown ½in. deep in rows about 12in. apart. In heavy soil that tends to compact or where large-rooted varieties are grown plants can be thinned 2in. to 4in. apart.

Half-long carrots are preferred in most home gardens for sowing at this time of the year. Good varieties are Manchester Table (Nantes) and Chantenay. Where the soil is shallow short carrots of the Oxheart type may be preferred. Especially in districts where carrots are difficult to grow the following varieties should be tried: Taranaki Strong Top, Topweight, Egmont Gold, Holmes Improved, and Sweetcrop.

Control of Carrot Rust Fly and Aphids

Where the carrot rust fly is troublesome precautions should be taken against it. The adult carrot rust fly is a small, shiny, black fly about 1/3in. long with reddish eyes and a yellowish head. It has yellow legs and one pair of wings.

The fly lays its eggs near the crown of the carrot, and when the larvae or maggots hatch they burrow down and attack near the tip of the taproot. Young plants may wilt and die. The maggots burrow into the tissue of the taproot and leave rusty brown tunnels, at first only near the surface. Maggots are slender, creamy white, rather rigid, legless, up to ¼in. long, and broad at one end and tapering to a slender head.

Dieldrin or lindane seed dressings may give protection for up to 2 to 3 months. If seed dressings are not used, the crop can be treated with lindane or dieldrin when the plants are showing the first true leaves. Lindane or dieldrin dust can be used, but drenching the soil with a solution is more effective.

The protection of long-standing crops can be ensured by spraying foliage with dieldrin (0.1 per cent.) or DDT at intervals of about 2 to 3 weeks. Carrot rust fly is unlikely to be troublesome south of Palmerston North.

The carrot rust fly should not be confused with the greenish aphids which attack the foliage and are usually very numerous. Aphids may be wingless or may have transparent wings. They suck the sap and stunt the growth, so that young plants may wilt in hot weather. The many tiny white specks present are the cast skins of the aphids. The foliage may take on a bronzing or a bluish or reddish hue and the leaf stalks become distorted.

Aphids are readily controlled by regular spraying with nicotine sulphate 1 : 600 (1oz. of nicotine sulphate to 4 gallons of water plus ½oz. of soap, which should first be dissolved in a little hot water) or lindane at recommended strengths. The leaves of the carrots must be thoroughly covered with spray. A still, warm day should be chosen for spraying.

Studies of the life history of the carrot rust fly show that in many districts attacks are most severe during the following periods: Mid-September to mid-October, the end of November to the end of December, mid-January to mid-February, and mid-April to mid-May. If possible, sowing dates should be arranged so that thinning does not have to be done during these periods, because the disturbance to the soil attracts egg-laying flies.

Frost-tender Vegetables

A good way to obtain early crops where there is danger of frost until late October or even November is to sow such tender plants as pumpkins, marrows, and cucumbers in heat under glass or under one or other of the plant protectors already described. An electrically heated hot-bed is excellent, though a hot-bed of fermenting manure, hops, or other organic material is easily made if suitable material is available.

The recognised safe dates for planting out frost-tender vegetables vary considerably in different districts. As about a month of favourable conditions is required to raise seedlings of most cucurbits to a size where they can be planted out, time of sowing must be correlated with the facilities available for raising the plants and the time of the last killing frost. It is not advisable to sow too early, as cucurbits do not transplant readily, and difficulty in transplanting and the resultant setback are greater when the plants are large.

In a few parts of the North Island frost-tender vegetables, such as dwarf and climbing beans and cucurbits, can be sown outdoors by about mid-September, but in most districts it is necessary to defer sowing until late October or even early November. Even where protection can be given against frost nothing is to be gained by sowing in cold, wet ground.

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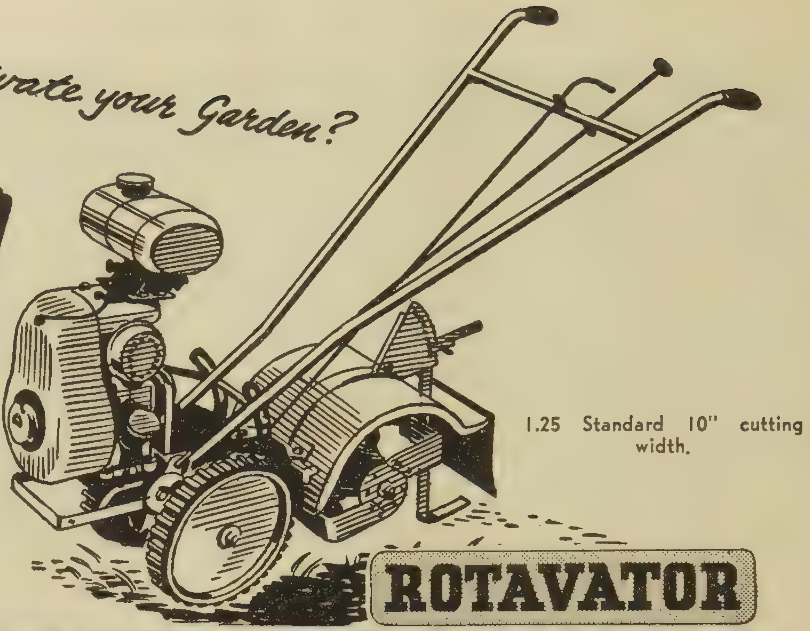

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gardens having sufficient space. The tubers (either cut or whole) should be planted 3in. to 4in. deep and 15in. to 18in. apart in rows 3ft. apart. Three pounds of small tubers will plant about 100ft. of row.

Artichokes are very hardy and do not require any particular type of soil, though they do well in fertile, well-worked loams. They are rarely troubled by pests and diseases.

Leeks

Leeks are one of the most reliable vegetables for autumn, winter, and spring. Though they stand well in cool, moist conditions, they send up seed heads fairly quickly if subjected to dry, warm conditions. To ensure a long season of supply it is advisable to make two or three sowings. Their culture was fully discussed in the June "Journal".

Because of cool soil conditions the earliest sowings in most districts are best made in a box of prepared soil under glass. Seed can now be sown outdoors thinly ½in. deep in rows 12in. apart. London Flag or Broad Flag is a good variety for this sowing, as it matures a little more quickly than either Musselburgh or Lyon, though either of these can be sown if desired.

Onions

In the South Island and in districts where main-crop onions are usually sown in spring seed should be sown as soon as ground conditions are favourable. Though varieties and cultural practices have an important bearing on production, fairly heavy soils usually produce good-keeping but relatively slow-maturing onions and sandy soils quick-maturing onions that are generally of poorer keeping quality.

Organic matter does not have to be applied to soils that are reasonably fertile if the water-table is high and if the composition and placement of fertilisers are suitable. However, plant food should be readily available, but in such a form and in such quantities that it does not cause burning or, paradoxically, starvation.

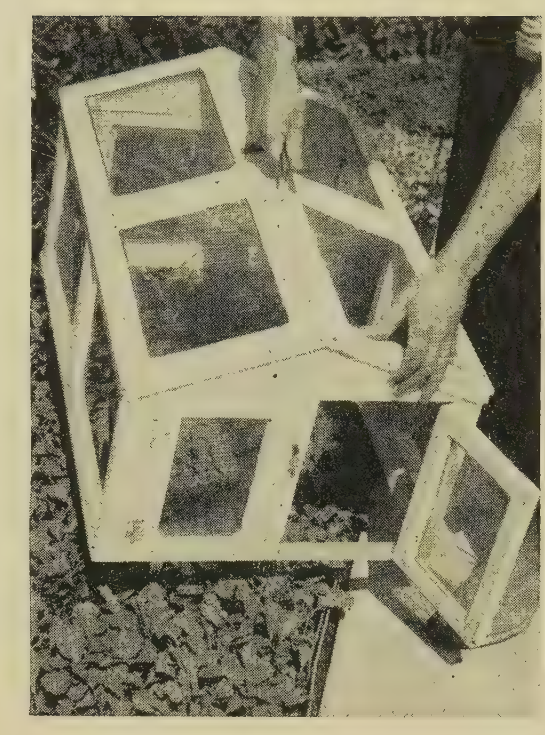
Onion roots arise from the stem plate at the base of the fleshy part of the plant. They are fine, but very numerous, radiating in all directions and forming a fibrous tuft. On most soils the roots are not more than 10in. to 12in. long, though occasionally they may be 20in. They do not arise as normal plant roots, but continue to develop from the stem plate as long as the plant is growing. The main root zone is usually within 6in. of the bulb.

Onions require a slowly available source of nitrogen, and on most soils crops will benefit from a heavy dressing of stable or farmyard manure applied in autumn and to which has been added (to balance its nitrogen and potash content) about 1/30 part by weight of superphosphate. If onions of good keeping quality are required, it is not advisable to apply in spring excessive quantities of organic manure which contain a considerable amount of nitrogen, as bulbs may be stimulated into excessive leaf growth and weeds are liable to be troublesome.

Few home gardeners are likely to have much farmyard manure, but available compost should be applied with a complete fertiliser at about 3oz. to 6oz. a square yard. Because of the great variation in soils and their condition throughout New Zealand only local experience can indicate fertiliser requirements. If soil conditions and fertiliser placement are correct, it seems difficult, judging by experiments made, to over-manure onions.

The seed-bed should be worked down to a fine, firm tilth and seed sown thinly ½in. deep in rows 12in. to 15in. apart.

Good varieties include Ailsa Craig and Straw Spanish (both early) and Pukekohe Long Keeper (for storage).



[*Green and Hahn*

Miniature glasshouse type of cloche.

Peas

In gardens where peas have not yet been sown they should be put in without delay if soil conditions are favourable. Each pea crop can be harvested for only a limited time and successional sowings are usually advisable.

Peas do well in cool, well-drained soils rich in humus. As they repay good cultural methods, the ground should be deeply dug and manured, preferably some time before sowing, with organic material such as compost or farmyard manure. Before sowing, a complete fertiliser, or if the soil is in good condition a dressing of 2oz. to 3oz. of superphosphate to the square yard, can be well worked into the soil.

If a shallow trench is first taken out and the seed pressed into the bottom of it 1in. to 1½in. deep (according to whether the soil is heavy or light), the plants can be earthed up conveniently as soon as they show a tendency to straggle or fall over between the rows. Dwarf varieties such as William Massey and Little Marvel can be grown without staking in rows 20in. apart, if they are kept well earthed up.

Rows of the mid-season varieties such as Greenfeast and Victory Freezer should be planted at least 3ft. apart and require staking. Material such as brushwood, netting, or sticks can be used. Vines must be supported so that they will not provide a refuge for slugs, which eat the pods. Staking also prevents the pods from rotting through contact with the soil. The varieties mentioned are among the best. One pound of pea seed is sufficient for about 100ft. of row.

If slugs are troublesome, they can be controlled by parametaldehyde baits, obtainable from most seedsmen.

Potatoes

It is too early in most districts to plant main-crop potatoes, though an early planting can be made if the home gardener is prepared to keep the tops earthed up while frosts are likely to cause damage. It is not necessary to green and sprout tubers before planting, but earlier crops can usually be obtained from sprouted seed.

Government-certified seed should be used if possible. Few vegetables are subject to as many diseases as potatoes, and only the expert can recognise many diseases in the tubers. Tubers infected with virus diseases, such as leaf roll, mosaic, and crinkle, may appear healthy and of a desirable type, yet if it were not for the system of certification, these diseases would reduce the total yield of potatoes in New Zealand by perhaps a half or two-thirds. Virus diseases are transmitted mainly by aphids (green fly), the lower incidence of which in the South Island is the main reason for the growing of most of the certified seed there.

Apart from the purchase of certified seed, the important points in potato growing are choice of variety suited to the soil and district and the purpose for which the variety is grown (that is, early, second early, main, or late crop), soil condition, and cultivation. Soil can be maintained in good condition by the addition of humus or humus-forming materials, by the judicious application of fertiliser, by suitable rotation of crops, and by drainage where necessary.

Soil and Fertilisers

The soil for potatoes preferably should be deeply and thoroughly cultivated, as thorough preparation of the soil not only ensures a good seed-bed but helps to maintain satisfactory moisture content, aeration, and temperature. Soils that have been trenched should be given time to settle before planting.

Heavy dressings of organic manure just before planting are not advisable, as they may induce conditions which favour the development of scab. A heavy dressing applied the previous year, so that it is thoroughly decomposed, or a green crop dug in some time before planting will usually help to give satisfactory results, as also will the addition of such material as grass clippings.

Soils which have been heavily limed or heavily dressed with the ashes of the garden bonfire should not be used. The potato is tolerant of acid conditions, and in soils infected with common potato scab the organism will be suppressed if the soil is fairly acid to strongly acid. Lime increases the alkalinity of the soil.

The fertiliser required for potatoes depends greatly on the amount of organic matter previously incorporated in the soil, but generally Department of Agriculture trials in New Zealand have shown that a mixture (by weight) of 1 part of sulphate of ammonia and, according to soil type, 3 to 5 parts of superphosphate applied at about 1½oz. to 2oz. per yard of row will give good results. The addition of muriate of potash or sulphate of potash, preferably the latter, at about ⅓oz. to a yard of row will give improved results on many soils and is advised for most home garden soils. Instead of superphosphate and sulphate of ammonia equal parts of superphosphate and blood and bone can be used.

Planting

The simplest way to plant is usually to open a trench about 4in. to 5in. deep and to dust the fertiliser along it. In the home garden rows are usually 2ft. apart and tubers can be placed from 9in. to 14in. or 16in. apart in the rows. The wider spacings are favoured for main-crop or very large growing varieties.

If tubers are large, that is, 4oz. or more, they can be cut into two or more sets if desired. Each should be chunky and have at least two eyes and a minimum of cut surface.

Cut surfaces should not be allowed to dry out, but should heal or callus over promptly. The pieces should be planted immediately they are cut in a soil that is neither too wet nor too dry.

If soil conditions are not favourable, tubers can be cut and left with the cut surfaces in contact, though they should be broken apart from time to time. Alternatively they can be kept at a temperature of 60 to 70 degrees F. and a very high humidity for about 7 to 10 days. However, to prevent excessive sprouting temperature and humidity should be lowered as soon as healing is complete. Hygiene is also very important in handling cut tubers, as the tubers are liable to attack by soft-rotting organisms until the cut surfaces heal.

Though for early crops Epicure and Arran Banner are most commonly planted, numerous other varieties listed in good seedsmen's catalogues are suited to different districts. For example, Jersey Bennes is favoured in Otago.

Lettuces

Lettuce seed should be sown without delay, or if sufficient time has elapsed since the last sowing, a further sowing should be made. For lettuces grown early in the season, when conditions are cool, a variety such as Imperial 410 (Triumph) or Imperial 615 (Neapolitan Winter) is especially suitable. Later, varieties such as Webbs Wonderful (New York 515) or Great Lakes can be used.

Seed can be sown ¼in. deep in rows 12in. to 15in. apart in well-drained, deeply cultivated soil of high humus content. Early in the season lettuces can be transplanted successfully. They are usually set out 8in. to 12in. apart. When the weather becomes hot and dry it is better to sow seed thinly where the plants are to mature and to thin seedlings to 8in. to 12in. apart.

Radishes

Small successional sowings of radishes should be made as required. Cultural requirements are similar to those of beetroot and carrots, but as most varieties of radishes mature much more quickly than other root crops, they are more sensitive to adverse soil conditions.

The soil should be well drained and preferably light, with the top 6in. cultivated to a very fine tilth. It should be very rich in fine, well-rotted organic matter; well-matured compost is excellent, though improved results are usually obtained if in addition a complete fertiliser is applied at about 1oz. to 2oz. per square yard.

Radishes usually grow best in a soil that is slightly to moderately acid. Lime is therefore unnecessary on many soils that have been limed for a previous crop, though a light dressing, applied preferably some time before sowing, is likely to be beneficial on soils in high-rainfall areas.

The soil should be gently firmed after cultivation, as the roots do not bulb well in loose soil. The soil should not dry out and in mid-summer shelter from the sun is advisable; summer crops should be sown in the shade of taller crops.

Seed can be sown at any time of the year in well-drained soil, provided there is sufficient moisture and the ground temperature is not below about 52 degrees F. The seed should be sown thinly (about 12 to 15 seeds for each 1ft. of row) ¼in. deep in rows that need be only about 6in. to 8in. apart for any except the Chinese varieties. Alternatively the seed may be broadcast, though weeding is then more difficult. If beds are too wide, it may be difficult to harvest the roots without treading on the bed.

Varieties of radishes can be grouped as oval, turnip-shaped, long, and giant or Chinese. Any of the smaller or medium radishes, such as French Breakfast, White Icicle, Long Scarlet, or Chartier, is suitable for sowing now.

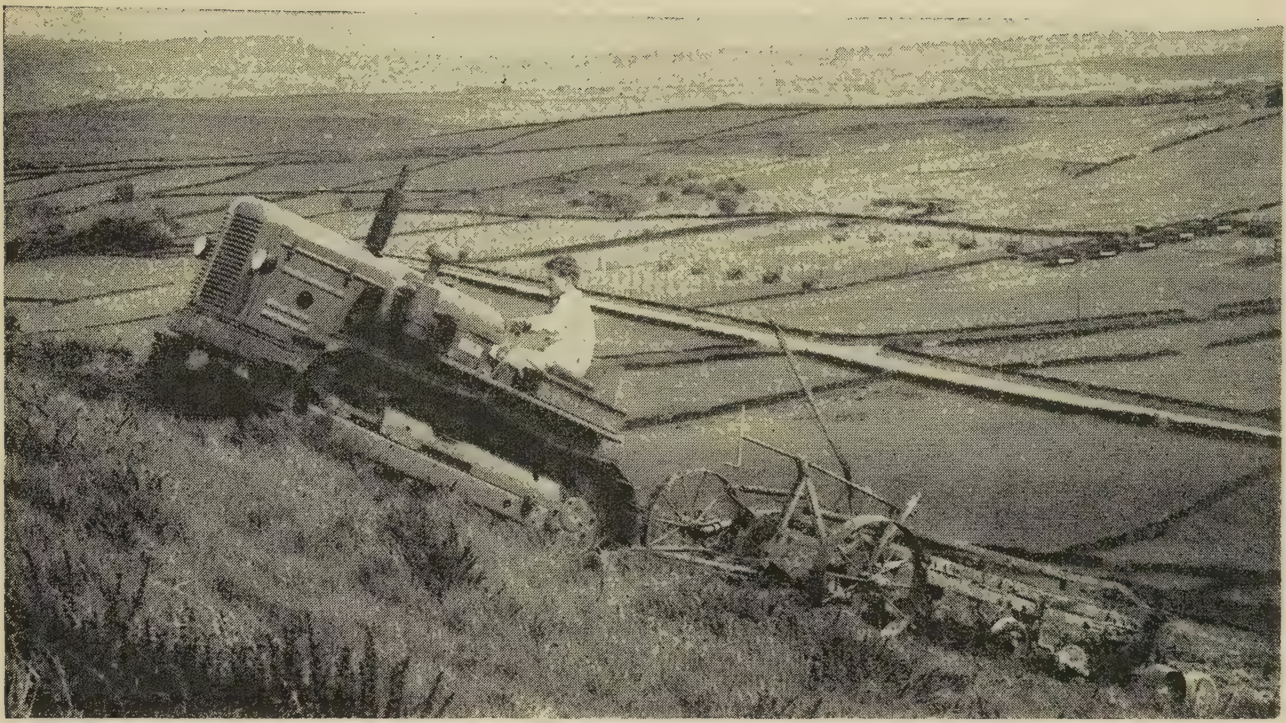
Summer, Autumn, and Winter Greens

An early sowing of brussels sprouts can be made late this month. Many home gardeners in the warmer and drier parts of New Zealand consider brussels sprouts difficult to grow because of attacks of grey aphids. Regular spraying with nicotine sulphate (1oz. to 4 gallons of water plus ½oz. of soft soap) should ensure that the plants are kept clean.

However, spray coverage must be complete and if possible a hot, still day should be chosen for the application of nicotine sulphate. Lindane at recommended strengths may be more efficient at lower temperatures. When nicotine sulphate is used the precautions listed on the package should be observed meticulously.

Seed of brussels sprouts should be sown ¼in. deep in rows 1ft. apart. The seed-bed should be rich in humus and well worked to a fine tilth. The young plants should be ready for setting out in about 6 to 8 weeks.

An early sowing of winter cauliflower (broccoli) can, if desired, be made at the same time as the brussels sprouts, the requirements for sowing and planting out being the same. Summer cabbage and cauliflower can also be sown.



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Government Assistance to Farmers in the United Kingdom

By J. B. QUIGG,
Investigating Officer, Department of Agriculture, Wellington

NEW ZEALAND is vitally interested in agricultural production trends in the United Kingdom because of their effects on the market for New Zealand produce in Britain. Today British farming is being encouraged by very large subsidies, which must be viewed here with concern, because they tend to produce increasing quantities of commodities which compete directly with New Zealand's main exports. Just how extensive is the British Government assistance to United Kingdom farmers is shown in this article.

MOST people in this country are aware that the United Kingdom is one of the foremost industrialised countries of the world and, at the same time, is the principal outlet for New Zealand's large export surplus of meat and dairy produce. What is not generally realised is that agriculture itself is one of the largest and most important industries in the United Kingdom.

In the middle of the 19th century Britain was largely self-sufficient in agricultural production. Then wool, grain, and later meat were increasingly imported and there was greater concentration on the production of milk, eggs, pigs, and horticultural produce. Except during the First World War, the arable area in Britain declined continuously from 1872 to 1939 and the meat, dairy, and poultry industries became increasingly dependent on imported feeding stuffs.

The shortage of shipping space for imports during the Second World War made increased agricultural production in Britain imperative and required more emphasis on the production of crops for direct human consumption, such as wheat and potatoes, at the expense of livestock and livestock products other than milk. Before the Second World War Britain produced about 31 per cent. of its food supplies (in terms of calories for human consumption). By 1953 this had risen to nearly 50 per cent. The comparable figures in values are 36 per cent. and 51 per cent. respectively.

Imports of food and feeding stuffs accounted for 45 per cent. of the total value of all imports before the war and about 40 per cent. in 1953. The increasing dependence on home production for food supplies is well illustrated in Table 1.

TABLE 1—U.K. PRODUCTION OF CERTAIN FOODSTUFFS AS PERCENTAGE OF TOTAL SUPPLIES

	Pre-war	1955
Wheat and flour	12	24
Sugar (refined)	18	23
Carcass meat and offal ..	51	61
Bacon and ham	29	45
Butter	9	7
Cheese	24	33
Shell eggs	71	91

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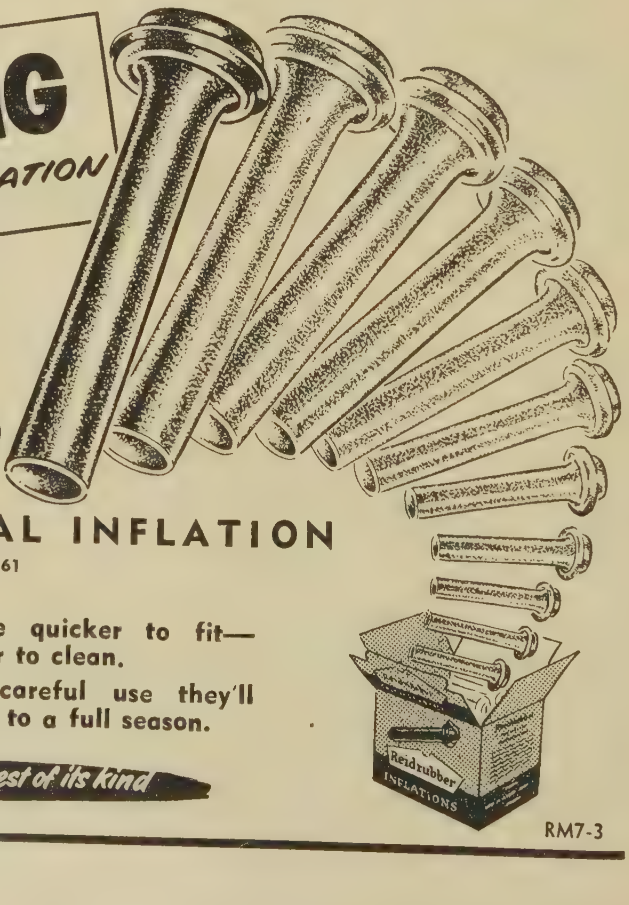

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[*British Official*

Harvesting with modern machinery. Before the Second World War about 5 million acres were devoted to the production of the principal grain crops—wheat, oats, and barley. Today the area in these crops exceeds 7 million acres.

milk and of barley for brewing and 95 per cent. of her requirements of potatoes.

Perhaps the best way of indicating the size and importance of agriculture in the United Kingdom is to compare a few of the more important statistics of the industry with similar statistics for New Zealand. This is done in Tables 2 and 3.

Government Assistance

The development of agriculture in the United Kingdom during the past quarter century has been due in no small measure to a policy of direct encouragement by the State. The severe agricultural depression which followed the fall in general prices after 1920 resulted in 1931 in the beginning of a programme of financial assistance, including tariffs, subsidies, and quotas.

TABLE 2—LABOUR, LAND, AND LIVESTOCK USED IN AGRICULTURE IN UNITED KINGDOM AND NEW ZEALAND

	United Kingdom	New Zealand
Labour force	1,007,000	137,000
Land occupied for agricultural and pastoral purposes (acres):		
Sown pasture ..	*13,500,000	17,500,000
Tussock and native grasses	†16,900,000	13,400,000
Arable	17,600,000	1,500,000
Fern, scrub, native bush, etc.	—	10,900,000
Totals	48,000,000	43,300,000
Crop acreages:		
Wheat	2,283,000	65,000
Barley	2,336,000	61,000
Oats	2,575,000	125,000
Potatoes	945,000	‡21,000
Livestock numbers:		
Cattle	10,600,000	5,900,000
Sheep	23,600,000	40,200,000
Pigs	5,500,000	700,000

* Permanent pasture.
† Rough grazing.
‡ Commercial production only.

Note: The statistics are for the most recent comparable year.

TABLE 3—PRODUCTION OF CROPS AND LIVESTOCK PRODUCTS IN UNITED KINGDOM AND NEW ZEALAND

	United Kingdom	New Zealand
	tons	tons
Crops:		
Wheat	2,830,000	72,000
Barley	2,813,000	56,000
Oats	2,496,000	39,000
Potatoes	7,325,000	*144,000
Livestock products:		
Milk (all purposes)	gallons	gallons
	2,207,000,000	1,120,000,000
	tons	tons
Butter	15,800	204,500
Cheese	63,500	96,300
Beef and veal	687,000	250,000
Mutton and lamb ..	191,000	352,000
Pig meat	660,000	40,000
Wool, greasy	48,000	203,000

* Commercial production only.

Note: The statistics are for the most recent comparable year.

Commodity commissions were set up for certain products, and, to enable producers to regulate their marketing, the Agricultural Marketing Acts of 1931, 1933, and 1949 provided for the establishment of agricultural marketing boards. During the Second World War the functions of the commodity commissions, marketing boards, and the like were largely suspended and the State exercised direct control over the level of production, prices, and imports.

In 1947 the Agricultural Act was passed. This provided the main basis of post-war agricultural policy in England and Wales and the controls to implement it. Similar Acts for Scotland and Northern Ireland were passed in 1948 and 1949 respectively.

The underlying principle of the 1947 Act was that the Government would provide the industry with a system of guarantees which would ensure "a stable and efficient agricultural industry capable of producing such part of the nation's food as in the national interest it is desired to produce". In return for this the Act gave the Government power to insist on a minimum level of efficiency.

In implementing the system of guarantees the Ministry of Agriculture, Fisheries and Food, the Department of Agriculture for Scotland, and the Ministry of Agriculture for Northern Ireland in conjunction with the farmers' representatives hold an annual review of the economic condition and prospects of the industry. In the light of the review, price guarantees are determined for livestock, livestock products, and crops, which in total represent about 80 per cent. of the value of the produce sold off farms in the United Kingdom. Special reviews may also be held at any time if there has been a substantial change in costs or in other conditions.

In 1956 the Government, recognising that an annual review by its nature could afford assurance to the industry for only a comparatively short time ahead, considered whether any practicable methods of providing long-term assurances could be devised. The

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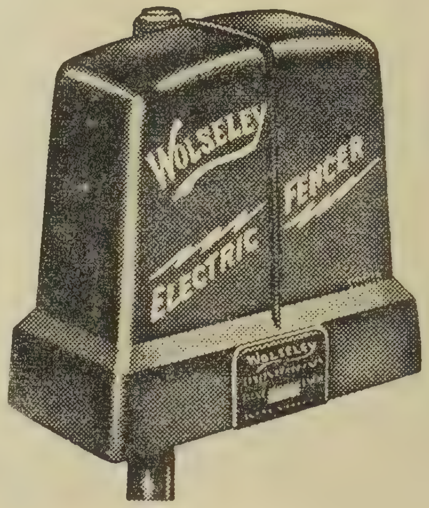

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Britain has long been noted for the quality of her livestock, particularly beef cattle. A view of the cattle section judging ring at a recent Smithfield show.

general conclusion was that there was no satisfactory alternative to annual reviews, which will take account of the many changing factors, and that the provision of long-term assurances must be sought through minimum guarantees rather than by an attempt to determine guaranteed prices for a period ahead.

It was decided, therefore, that the total value of the guarantees (including production grants, which are referred to later) will be maintained each year at not less than 97½ per cent. of the total in the preceding year, after allowing for cost changes that have occurred on review commodities since the last annual review. It was further decided that the guaranteed price for each commodity should not be less than 96 per cent. of the guaranteed price determined at the previous annual review. In addition the guaranteed prices for livestock and livestock products may not be reduced more than 9 per cent. in any 3 years.

The methods of implementing price guarantees are varied from time to time and differ for each commodity. Some of them are extremely complicated.

Table 4 gives the prices established at annual and special reviews in recent years.

TABLE 4—FARM PRICE GUARANTEES IN UNITED KINGDOM*

	1953-54		1954-55		1955-56		1956-57		1957-58	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Wheat (cwt.)	30	9	30	9	30 (29	0 9)	30 (29	0 9)	28	7
Rye (cwt.)	25	0	25	0	23 (23	3 0)	23 (23	3 0)	22	1
Barley (cwt.)	25	0	25	6	24 (24	8 6)	26 (26	2 0)	29	0
Oats (cwt.)	22	2	24	0	23 (23	3 0)	25 (24	0 9)	27	5
Potatoes (ton)	244	0	249	0	215 (212	10 6)	221 (217	3 0)	225	0
Sugar beet (ton; 16.5 per cent. sugar content)	122	3	125	7	127 (125	7 7)	130 (128	6 1)	130	6
Fat cattle (live cwt. gross weight)	133	2	133	2	138	8	151	0	156	0
Fat sheep and lambs (lb. estimated dressed carcass weight)	2	10½	2	10½	3	0	3	2	3	3½
Fat pigs (score deadweight)	54	3	51	3	51	4	49	7	51	11
Milk (gallon)	3	2.2	3	1.2	3	1.95	3	2.45	3	2.70
Eggs, hen (dozen)	4	0	4	0	4	1½	4	1½	4	1¼
Eggs, duck (dozen)	3	3½	2	9	2	9½	2	4½	2	5
Wool (lb. greasy)	†4	6	†4	6	4	10.25	4	8.25	4	8.25

* Prices in sterling; where two prices are shown against a year the one in brackets is that determined after a regular review and the other, which is the effective one, is the guarantee announced after a special review.

† Plus marketing costs of 4¾d. per pound in 1953-54 and 4¼d. per pound in 1954-55.

Price Guarantees

The methods adopted in implementing the guarantees are briefly as follows:—

Grains

For the 1954 and subsequent harvests a deficiency payments scheme was introduced. Under this scheme growers sell their produce for what it will bring on the open market. A record of all transactions is maintained by the merchants, and the difference between the average at-farm price and the guarantee is met by the Exchequer. There are variations in the manner of calculating and the methods of paying the deficiency payments for the various types of grains.

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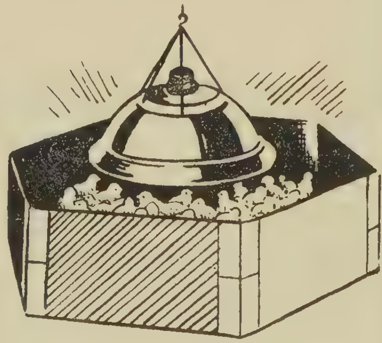

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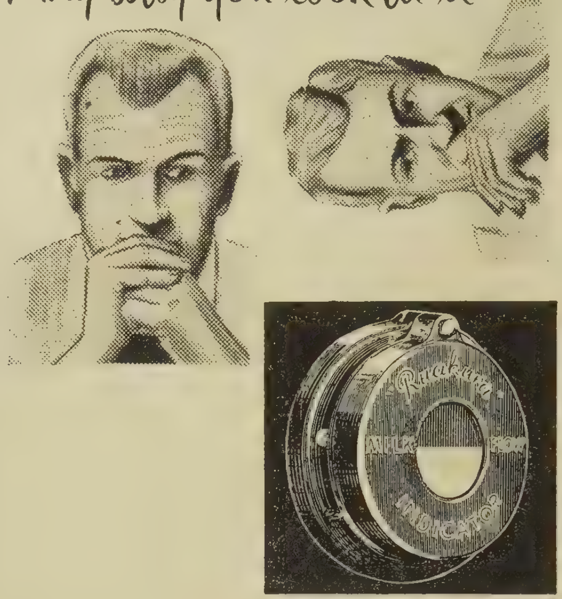

GIVES VISUAL ACCURATE EVIDENCE OF "LET-DOWN",

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GOVERNMENT ASSISTANCE TO FARMERS IN THE UNITED KINGDOM

Milk production plays a very important part in British agriculture. Left—In most areas dairy cattle are housed in barns or covered yards in winter. Right—Bottle-washing equipment in a large milk treatment station.

Potatoes

Up to and including the 1954 harvest the entire potato crop was purchased by the Ministry of Food at prices fixed annually. However, it was agreed at the 1954 annual review that the guarantee for the 1955-56 crop would be implemented by a support-price system operated through the Potato Marketing Board in Great Britain and the Ministry of Agriculture in Northern Ireland.

Under this arrangement the Potato Marketing Board will as a last resort make purchases at the guaranteed price (which is broken down into four regional and seasonal scales) if producers are unable to obtain this price on the open market. The Government makes up to the board 95 per cent. of the loss incurred by buying potatoes at the support price, leaving the other 5 per cent. to be made good by the board itself out of a levy on producers.

Fat Stock

From July 1954 the Government introduced a twofold guarantee system for livestock. This combined a guaranteed individual price on each transaction with a collective guarantee of a standard price for the industry as a whole. A single guarantee payment was introduced on 26 March 1956 for each of the three groups of livestock (cattle, sheep, and pigs).

The amount payable in each case was calculated by deducting from the guaranteed price the average price realised over 52 weeks, ended 2 weeks before the beginning of each 4-week guarantee period, and was subject to a "stabilising adjustment". This adjustment was an addition to or substraction from the payment which would otherwise have been made, to ensure that the average return to producers in any week did not differ from the guaranteed prices by the following amounts: Cattle, 23s. per live hundredweight; sheep, 4d. per pound dressed carcass weight; pigs, 5s. per score deadweight.

The following examples illustrate how the guarantee worked in practice:—

	Example 1	Example 2	Example 3
	s.	s.	s.
Guaranteed price	151	151	151
Price actually received	119	110	165
Average price realised over 52 weeks	140	140	140
Maximum or minimum price	128	128	174
Deficiency payment	11	18	9

In each of these the difference between the moving average price (140s.) and the guaranteed price (151s.) is 11s.

In Example 1 the actual price received is 119s., which is 9s. less than the minimum (128s.), but the farmer receives the full deficiency payment of 11s.

In Example 2 the actual price received is only 110s.; hence as the addition of 11s. would not bring him up to the minimum (128s.), he received 18s., making the price up to this level.

In Example 3 the addition of 11s. would bring his return to 176s., which would exceed the maximum; therefore the deficiency payment in this case is scaled down to 9s.

It is interesting to compare the prices guaranteed the United Kingdom producer of livestock in 1956-57 with the prices received by the New Zealand producer in the same period:—

U.K. PRODUCER	N.Z. PRODUCER
Fat Cattle	
151s. per live cwt. gross weight, plus or minus 23s. = 2s. 6.3d. plus or minus 4.6d. per lb. dressed weight.	North Island schedule price ruling in Jan. 1957 for chilled ox beef 680/U, 9.6d. per lb.
Fat Sheep and Lambs	
3s. 2d., plus or minus 4d. per lb. estimated dressed carcass weight.	Weighted average of North Island schedule prices ruling in Jan. 1957 for prime lambs 20/28, prime wethers 49/56, and prime ewes 49/56, 1s. 10d. per lb.

A new method of calculating guarantee payments for fat stock came into operation on 25 March 1957. For cattle and sheep the standard prices shown in the last column of Table 4 will be broken down into weekly seasonal standard prices, which will be specified later. The rate of guarantee payment in each case will be the amount by which the average of the last 4 weeks' actual market prices and the estimated market prices for the following 4 weeks falls short of the average of the seasonal standard prices for the same 8 weeks.

For pigs there will be no seasonal scale and the rate of guarantee payment will be the amount by which the standard price shown in Table 4 ex-

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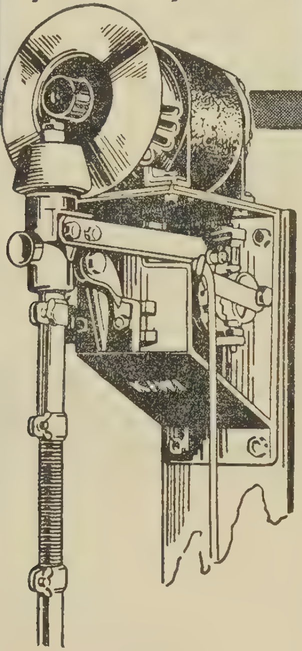
year in, year out



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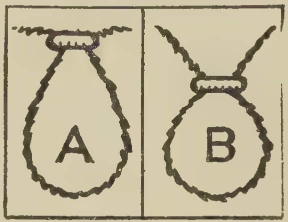
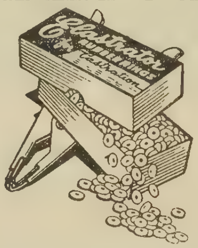


After placing ring on the purse DO NOT leave close to body as in sketch A.
PULL RING DOWN TO JUST ABOVE THE TESTES as in B—this leaves plenty of room for the development of **COD FAT**



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[*British Official*

A hillside farm in Derbyshire. Some 19 million acres of land in Britain—about one-third of the total area—consists of remote moors and uplands. To encourage the development of hill farming, hill sheep and hill cattle subsidies and improvements grants amounting to about £5.5 million were paid in the 1956-57 season.

ceeds the average of the last 4 weeks' actual market prices and the estimated market prices for the following 4 weeks, including quality premiums. As in previous years the rate of guarantee for pigs will be subject to adjustment in accordance with the operation of a feeding stuff formula.

The rate of guarantee payment for each group of stock will be calculated weekly and announced before the beginning of the week to which it relates. It will be subject to a stabilising adjustment in any week in which this is necessary to ensure that the average return to producers does not differ from the respective standard price — for cattle and sheep the standard price for the week in question — by more than 7s. per live hundredweight for cattle; 2d. per pound dressed carcass weight for sheep; and 4s. per score deadweight for pigs.

Milk

Before the Second World War the milk marketing boards in the United Kingdom were third parties to all contracts between producers and distributors of milk. At the beginning of the war the Ministry of Food assumed control over marketing and use of milk, the marketing boards acting as its agents for the purchase of milk from producers and the sale of milk to distributors and manufacturers.

The average price to the producer was fixed annually, the seasonal scale of prices being agreed to by the Government, the milk marketing boards, and the national farmers' unions. This procedure was confirmed by the Agriculture Act 1947. Up to March 1954 no limit was placed on the quantity of milk to which the guaranteed price applied. The producer received a fixed price for each gallon of milk irrespective of its ultimate use.

Marketing powers were restored to the milk marketing boards from 1 April 1954 and at the same time a somewhat different method of implementing the guaranteed price came into operation. The guaranteed average price for the United Kingdom, determined during the annual price review at 3s. 1.2d. per gallon for 1954-55, was broken down into a guaranteed price for a standard quantity of milk for each of the five milk marketing board areas.

If milk production in any area in 1954-55 exceeded the standard quantity, which was fixed at the level of total sales in the previous 12 months, the effective rate per gallon of the guaranteed price would be reduced. For 1954-55, 1955-56, and 1956-57 the standard quantities were not altered, but guaranteed prices were raised ¾d. a gallon in 1955-56 and a further ½d. in 1956-57. The standard quantities and guaranteed prices for each area for the 3 years are shown in Table 5.

In each area the guaranteed price is further broken down into a higher price for a primary proportion (which corresponds to the quantity sold for liquid consumption) and a lower price for the remainder of the milk. The higher price, which is a firm guarantee, applies to 81 per cent. of the standard quantity or to 81 per cent. of total sales if they are less than the standard quantity.

The lower price applicable to the rest of the milk represents what each board and the Government agree to be the likely average manufacturing price for the whole year; the higher price for the primary proportion is then calculated at such a level as would bring the return on the standard quantity to the over-all guaranteed price. In England and Wales and in the main Scottish area the lower and

TABLE 5—STANDARD QUANTITIES AND GUARANTEED PRICES FOR MILK

Area	*Standard quantities (mil. gals.)	Guaranteed price (pence per gal.) 1954-55	1955-56	1956-57
England and Wales	1,651	37.25	38.00	38.50
Main Scottish area	183	37.26	38.01	38.51
Aberdeen and district	19.5	37.90	38.65	39.15
North of Scotland	9	38.99	39.74	40.24
Northern Ireland	95	35.91	36.66	37.16
United Kingdom	1,957.5	37.20	37.95	38.45

* Standard quantities for 1957-58 are the same except that for England and Wales, which is 3½ million gallons higher.

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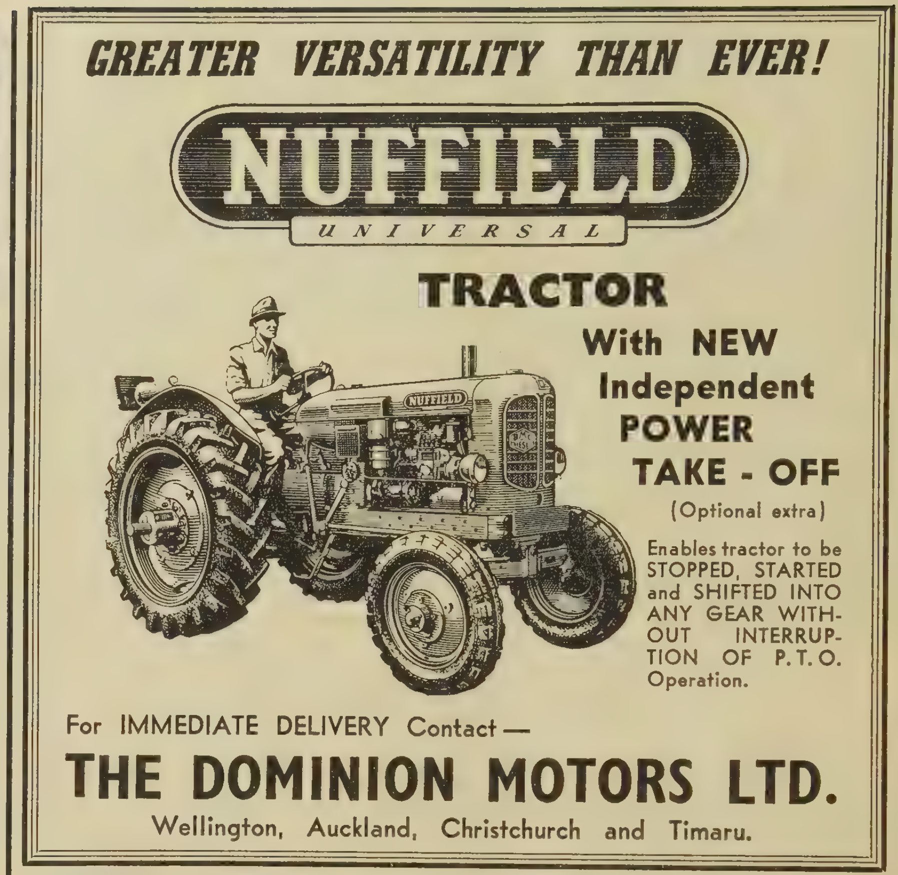

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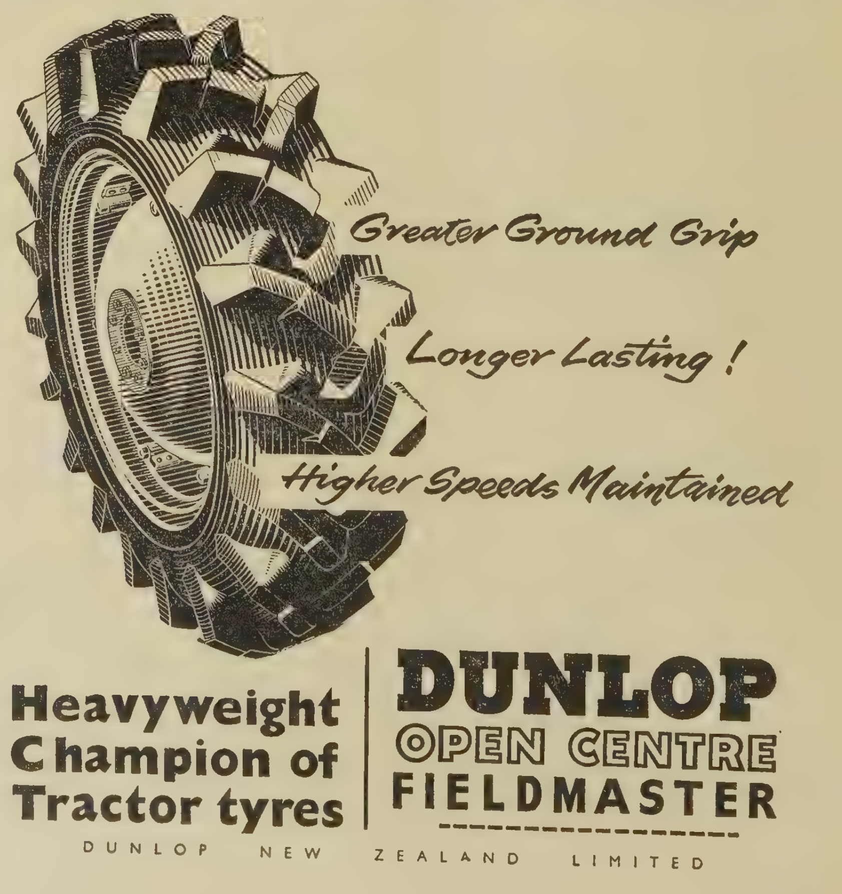

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higher guaranteed prices in 1954-55 and 1955-56 were as follows:—

	Lower d. per gal.	Higher d. per gal.
England and Wales:		
1954-55	17.25	41.94
1955-56	16.25	43.10
Main Scottish area:		
1954-55	17.25	42.35
1955-56	16.25	43.45

If the actual realisation on milk sold for manufacture differs from the forecast lower guaranteed price, each board is guaranteed the forecast price plus half any excess or minus half any deficiency, this arrangement being applicable to all milk outside the primary proportion, even if in excess of the standard quantity. Finally, at the end of the year the Government makes up any deficiency between the net revenue from total sales received by each board and the amount to which the board is entitled under the over-all price guaranteed for the standard quantity. Payments are also made to cover any consumer subsidy on liquid milk and the cost of the provision of cheap or free milk under welfare schemes.

Eggs

Before 14 May 1957 producers were required to send all eggs, except those sold directly to consumers, to licensed packing stations for testing, weight grading, and stamping. Market prices were determined by normal supply and demand, but the Government, through its company, NEDAL (1954) Ltd., was prepared to purchase packed and graded eggs from packing stations at guaranteed prices plus an approved charge to cover cost of collection, grading, and packing. Alternatively, packing stations were granted a direct cash allowance to enable them to pay the prescribed minimum prices while selling at current market prices.

The egg price announced after each annual review was converted to a seasonal scale of guarantees which was related to changes in market prices. The scale was also linked to changes in feeding stuff prices.

As from 14 May 1957 practically all sales of eggs came under the control of the newly established Egg Marketing Board. This board now administers the subsidy scheme. The Government will endeavour to ensure that the board receives a price equivalent to the guaranteed producer price plus an allowance for administrative costs and marketing expenses. This year the total will be 4s. 6.2d. per dozen.

It is officially estimated that the average realisation will be 2s. 10d. per dozen, so the Government will pay a flat rate of subsidy to the board of 1s. 8.2d. per dozen on all eggs handled. Should the average return differ materially from 2s. 10d. per dozen, the Treasury will share the difference (less 2d. a dozen) with the board, meeting 90 per cent. of any loss, but receiving 50 per cent. of any surplus.

Wool

All wool produced in the United Kingdom is marketed through the British Wool Marketing Board, which pays growers scheduled prices and employs agents to sell the wool on its behalf by public auction.

For the clips of the wool years 1951-52 to 1954-55 the price guaranteed by the Government comprised a grower return and a fixed marketing allowance. For clips from 1955-56 onward a consolidated guarantee has been announced annually. The board deducts from this guarantee a sum to cover its expected marketing costs, and the balance is paid to growers. The board's buying schedule is adjusted to ensure that the over-all average price for the season will be, as nearly as practicable, equal to the price element of the guarantee.

When the board's realised price on any year's wool clip exceeds the combined guarantee 90 per cent. of the surplus is paid into a reserve fund and 10 per cent. is retained by the board. If, however, any debt is outstanding to the Government in respect of past deficiencies, the entire surplus goes to pay off this debt.

If the board's realised price is less than the combined guarantee, this deficiency is met by withdrawal from the reserve fund or, if the reserve fund is inadequate, by a deficiency payment from the Government. These payments are carried forward as a debt to be paid from future surpluses. There are, however, special provisions to prevent the excessive accumulation of debts or credits.

Sugar Beet

Sugar beet is also subject to a price guarantee. However, as this commodity is not of particular interest to New Zealand, the arrangement will not be described.

Direct Production Grants

In addition to the price guarantee arrangements agriculture in the United Kingdom is assisted by a number of direct production grants. The more important of these will be described briefly.

Calf Subsidy

The calf subsidy is payable under the Agriculture (Miscellaneous Provi-

N.Z.-U.K. TRADE TALKS

[*Ministry of Agriculture, Fisheries and Food*

New Zealand Trade Mission to Great Britain, 1957. Signing of Trade Agreement by, left, Mr. K. J. Holyoake, Deputy Prime Minister and Minister of Agriculture and leader of the New Zealand delegation, and Sir David Eccles, President of the U.K. Board of Trade. Left to right at back: Sir Clifton Webb, New Zealand High Commissioner in Great Britain, Mr. S. D. Reeves, President, Federated Farmers of New Zealand, Mr. E. J. Fawcett, Director-General of Agriculture, and Mr. J. D. Ormond, Chairman, New Zealand Meat Producers Board.

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(Should be with every shepherd)

Staminal is a restorative, energising and stimulating food, immediately available to the blood stream and muscles. Sustains weak and perishing lambs which have not had their first drink from their parent, without injury to their delicate digestive system. A solution in warm water 50% Staminal and 50% water, about three teaspoons at a time will put lambs on their feet, and enable them to drink from the ewe. Ideal for all classes of stock and racehorses.

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Greater draw-bar pounds pull. Four forward speeds. Slower low gear—for operation ease and safety. Greater comfort in the driving position.

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Bush and undergrowth being cleared with a bulldozer and gyro tiller. Since 1945 much waste land in Britain formerly considered useless has been developed and is yielding good returns.

sions) Act 1949 and the Agriculture (Calf Subsidies) Act 1952.

In 1952 the subsidy was fixed at £5 per head for any steer or heifer beef-type calf born between 1 October 1951 and 29 October 1955. At the 1955 review of agricultural prices the subsidy was raised to £7 10s. for calves born after 1 April 1955.

The subsidy was subsequently extended for a further 3 years to October 1958, and at the 1956 review the rate was increased to £8 10s. for steer calves born on or after 1 April 1956. The subsidy on heifer calves remained at £7 10s.

The Civil Estimates for 1956-57 provided for an expenditure on calf subsidy of £11.3 million. The corresponding figure for the previous year was £8 million.

Hill Cattle and Hill Sheep Subsidies and Improvements Grants

The hill sheep subsidy was introduced in 1940 and applied to breeding ewes. The subsidy on breeding cows and other cattle on hill grazing was introduced in Scotland in 1941 and extended to the rest of the United Kingdom in 1943.

These subsidies have continued in the post-war years under the authority of the Hill Farming Act (1946) and the Livestock Rearing Act (1951). The former Act in addition to continuing the payment of the subsidies made provision for the payment of an improvement grant equal to half the cost of any approved work to assist in the development of existing hill farming land and the reclamation of land which could be made suitable for hill farming.

The Livestock Rearing Act extended the Hill Farming Act in several ways; grants equal to half the cost of the work done were extended to upland areas as well as hill farming land, the funds available for grants were increased, and the subsidies were extended to 1956. A further Hill Farming Act passed toward the end of 1956 extended these provisions until 1963.

The hill cattle subsidy rate has been varied from time to time as between the rate payable for breeding stock and other eligible cattle. For the years 1954 to 1956 there was to be a single rate of subsidy of £2 per head. However, at the end of June 1953 a new hill cow subsidy was introduced for England and Wales covering 1953 to 1956 under which £10 a head was to be paid on breeding cows and in-calf heifers in regular breeding herds kept on hill and upland farms throughout the year.

Cows kept solely for milk production were not eligible, but herds kept for breeding store cattle qualified as long as all calves were reared, even though small quantities of surplus milk might be sold in summer. In such cases the subsidy would be reduced in proportion to the quantity of milk sold.

The original hill cattle subsidy continued in England, Wales, and Northern Ireland until the end of 1956, but not more than £10 was paid on any animal that qualified under both schemes. The hill cow subsidy continues at the rates mentioned until 1963 under the provisions of the 1956 Act.

In Scotland the subsidy paid for breeding cows and in-calf heifers kept on hill land has been £10 per head since 1953.

The hill sheep subsidy is payable at a standard rate for self-maintained flocks of eligible ewes and shearling ewes of hardy hill breeds kept on hill farms. A reduced rate (one half of the standard rate) is payable for flocks of eligible ewes maintained by the purchase of ewes, shearlings, and ewe lambs.

The standard rate, which has varied, was 2s. 6d. per head in 1952. No payment was made in 1952-53, 1953-54, and 1954-55. As part of the annual price review settlement in 1955 a special non-recurring payment was authorised for ewes and shearling ewes of hardy hill breeds kept on hill land on 3 December 1954; a standard rate of 5s. per head was fixed for self-maintained flocks and a reduced rate of 2s. 6d. per head was agreed for other flocks. This payment was continued at the same rates in 1956.

The 1956-57 Civil Estimates made the following provision for expenditure under the headings discussed above (the figures shown in brackets being the estimates for 1955-56):—

	£	
Grants for improvement of livestock rearing land	1,529,000	(2,159,000)
Hill sheep subsidy ..	1,180,000	(2,122,000)
Hill cattle subsidy ..	2,745,000	(2,725,000)

General Fertiliser Subsidy

The Agriculture (Fertilisers) Act 1952 provides for Government assistance to occupiers of agricultural land for expenditure on fertilisers. The maximum contribution under the Act is 50 per cent. of the expenditure which occupiers would have incurred if there had been no provision for contributions, and there is provision for varying amounts of contributions for different fertilisers. At 1 May 1955 15 per cent. was granted toward the cost of nitrogenous fertilisers and 30 per cent. toward phosphatic.

The 1956 annual review provided for increased rates of subsidy for nitrogenous and phosphatic fertilisers as from 1 July 1956. This involved additional payments of about £3 million. It has been estimated that a further £3 million additional expenditure will result from the determination made at the 1957 review to fix increased rates of subsidy for nitrogen as from 1 July. The total amount provided in the 1956-57 Civil Estimates for the General Fertilisers Subsidy was £16.5 million.

Lime Subsidy

The Agriculture Act 1937 provided for contributions by Government toward the cost incurred by any occupier of agricultural land in acquiring and transporting 2 tons or more of lime or basic slag to be used to improve the fertility of the land. The maximum contributions were 50 per cent. for lime and 25 per cent. for basic slag.

The maximum contribution for lime was increased to 75 per cent. by the Agriculture (Miscellaneous Provisions) Act 1943.

The Agriculture Act 1947 provided that contributions may be made: (a) Toward the cost incurred not only by an occupier of land, but by any person having an interest in land, (b) Not only toward the cost incurred in acquiring and transporting lime, but toward any cost incurred (or to be incurred) in bringing lime from the place to which it is delivered by the supplier of the lime to the land to which it is to be added and in spreading it on that land.

The Agriculture (Miscellaneous Provisions) Act 1954 gave powers for the continuation of the making of grants or contributions in respect of liming, and at 1 May 1955 the rate of contribution was 60 per cent. of the cost plus up to 18s. an acre for spreading. The annual review for 1957 provided for minor extensions in the scope of the lime subsidy as from 1 July 1957.

TABLE 6—ESTIMATED COST OF AGRICULTURAL SUPPORT IN UNITED KINGDOM

	£ m.	£ m.	£ m.
Direct subsidy payments under agricultural price guarantees:			
Cereals:			
Wheat and rye	15.9		
Barley	8.9		
Oats and mixed corn ..	1.4		
		26.2	
Fat stock:			
Cattle	34.0		
Sheep	9.3		
Pigs	31.5		
		74.8	
Home-produced eggs ..		28.6	
Milk (excluding school and welfare milk) ..		22.1	
Potatoes		0.5	
Wool		0.4	
			152.6
Agricultural production grants:			
General fertiliser subsidy		20.0	
Lime subsidy		9.3	
Grants for ploughing up grassland		9.0	
Field drainage and water supply grants ..		2.8	
Grants for improvement of livestock rearing land		1.7	
Bonus payments under the Tuberculosis (Attested Herds) Scheme		10.3	
Livestock, improvement of breeding		0.1	
Calf subsidy		11.9	
Hill sheep and hill cattle subsidy		3.9	
Grants for silos		0.1	
Marginal production assistance grants		2.2	
			71.3
Administrative overheads applicable to direct subsidy payments and agricultural production grants			5.0
Trading subsidies in implementation of agricultural guarantees:			
Home-produced eggs ..		4.9	
Potatoes		1.0	
			5.9
			234.8

The 1956-57 Civil Estimates provides £9 million for contributions toward the cost of acquiring, transporting, and spreading lime. In the previous year the estimates were £10 million.

Grants for Ploughing up Grassland

The making of grants toward the cost of ploughing up land under grass and for subsequent operations on the land is provided for in the Agriculture (Ploughing Grants) Act 1952. The Act provides that any scheme for making grants shall specify that the land must have been continuously under grass for a certain period before ploughing. Grants may vary for different kinds of land under grass. Grants under the Act can be made only where land has been ploughed up within the period specified in the scheme in accordance with which they are made.

At present the rates of grant are £7 an acre for land which had been down to grass for 3 years or more and £12 an acre for land in grass since 1946 where undue expense is involved. Minor extensions in the scope of the ploughing grants will be made as from 1 July 1957.

According to the 1956-57 Civil Estimates grants under this heading were estimated to cost £6.6 million in 1956-57 compared with £5.6 million in 1955-56.

Bonus for T.B. Free Herds

Under the Diseases of Animals Act 1950 bonuses may be paid to the owner of any herd of cattle in Great Britain for the purpose of securing, as far as practicable, that the herd will be free from tuberculosis. Estimated expenditure under this heading in 1956-57 was £11 million and in 1955-56 £11.4 million.

Estimated Cost of Assistance

The Minister of Agriculture, Fisheries and Food has given the estimates of the cost of agricultural support in 1956-57 shown in Table 6.

The magnitude of the assistance afforded the industry is clearly apparent from the table, particularly when cognisance is taken of the fact that estimated gross agricultural output for 1956-57 was £1489.5 million and estimated net income £317 million. The extent to which this assistance has stimulated production is shown in Table 7.

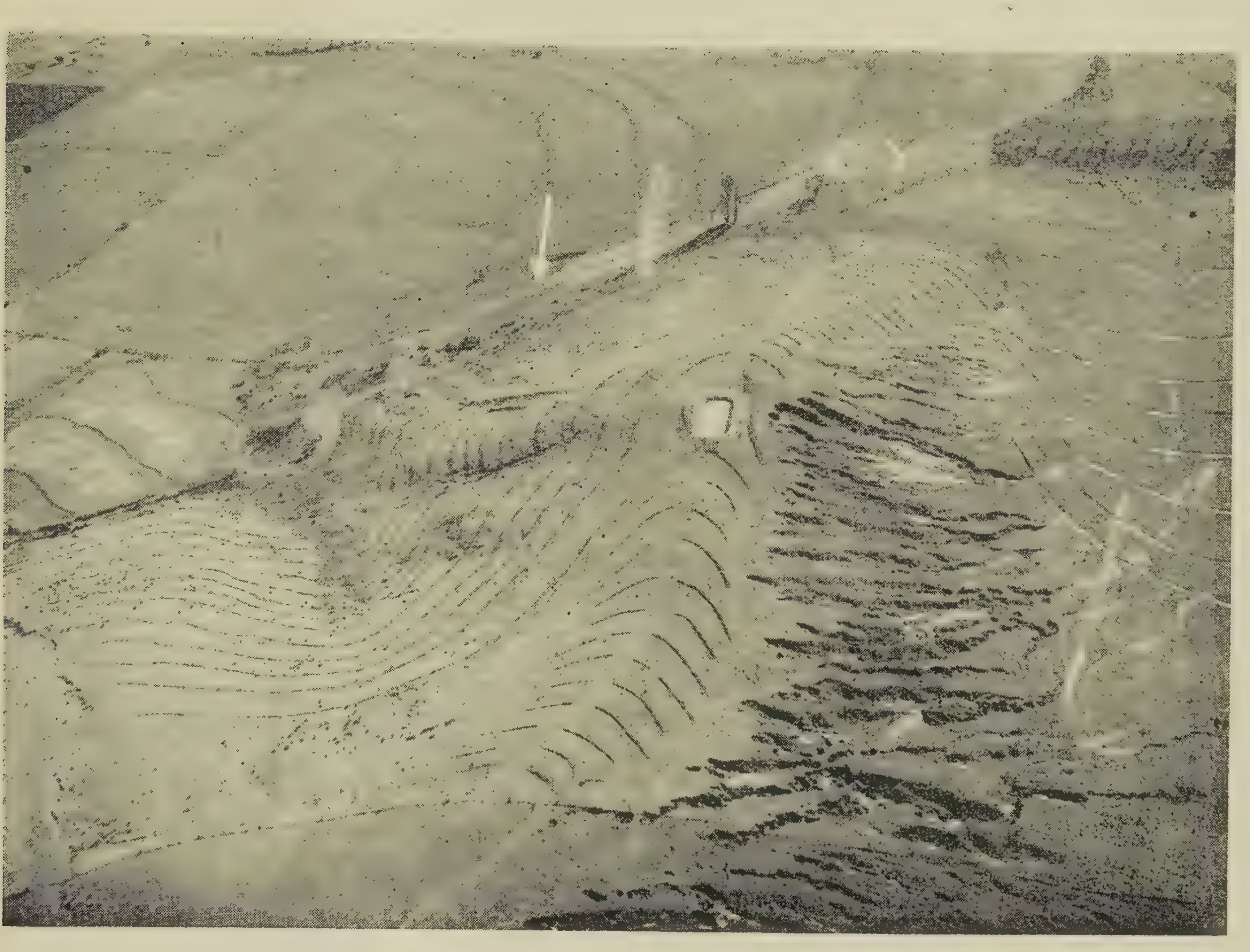
TABLE 7—AGRICULTURAL PRODUCTION IN UNITED KINGDOM

	Pre-war average	Estimated 1956-57
	tons	tons
Wheat	1,651,000	2,830,000
Barley	765,000	2,813,000
Oats	1,940,000	2,496,000
Potatoes	4,873,000	7,578,000
Sugar beet	2,741,000	5,235,000
Eggs	385,000	594,000
Beef and veal ..	578,000	782,000
Mutton and lamb ..	195,000	199,000
Pig meat	435,000	661,000
Wool (clip)	34,000	32,000
	gallons	gallons
Milk	1,556m.	2,335m.

Meteorological Records for June

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	52.0	— 0.1	65.2	31.9	3.51	11	— 3.57	1.78	23	169
Auckland	160	53.3	+ 0.3	63.3	36.6	3.38	20	— 2.01	1.56	23	131
Tauranga	10	50.7	+ 1.8	64.8	27.8	4.20	10	— 1.35	2.40	23	137
Ruakura	131	48.6	+ 1.1	62.2	23.8	3.08	22	— 1.70	1.11	23	98
*Whakarewarewa ..	1006	47.4	+ 2.1	60.8	28.2	5.41	12	— 0.12	3.09	16	
Gisborne	12	49.4	+ 0.6	65.6	20.0	7.75	13	+ 3.54	3.81	17	144
New Plymouth ..	160	51.2	+ 1.1	63.4	34.0	3.94	14	— 2.24	0.72	23	111
Karioi	2125	42.1	+ 0.6	55.5	25.0	4.97	22	— 0.13	1.20	23	
Napier	5	50.8	+ 2.1	68.9	33.8	7.56	13	+ 4.50	2.78	17	148
Wanganui	72	50.4	+ 1.6	62.4	34.9	3.61	15	+ 0.22	1.43	23	90
Palmerston North ..	110	49.0	+ 2.0	62.2	28.5	3.80	22	— 0.55	0.95	23	88
Waingawa	340	46.6	+ 1.2	63.0	25.3	4.30	14	+ 0.21	1.90	23	128
Wellington	415	49.4	+ 1.7	63.8	35.7	4.86	9	+ 0.21	3.05	16	130
Nelson airfield ..	5	45.4	+ 1.3	63.3	25.3	0.22	5	— 3.07	0.09	30	161
Blenheim	12	47.1	+ 2.2	66.1	24.8	0.38	6	— 2.10	0.20	30	153
Hokitika	15	44.0	— 0.3	56.1	28.1	9.64	20	+ 0.81	2.44	30	100
Hanmer	1270	40.8	+ 1.1	61.0	20.0	3.84	10	+ 0.35	1.32	17	97
Christchurch ..	22	44.4	+ 1.2	67.6	27.1	1.11	11	— 1.48	0.27	1	117
Ashburton	323	44.4	+ 2.6	67.2	24.5	1.64	8	— 0.96	0.72	15	134
Timaru	56	43.8	+ 1.4	62.2	27.5	1.04	9	— 0.83	0.30	12	126
Alexandra	520	40.8	+ 3.1	64.2	20.5	0.35	8	— 0.44	0.08	10, 29	122
Taieri	80	43.4	+ 1.6	62.3	24.0	1.79	15	— 0.53	0.68	10	97
Invercargill airfield ..	0	42.7	+ 1.1	61.0	23.3	6.82	23	+ 3.17	0.88	11	68
Chatham Islands ..	140	47.9	+ 1.4	57.4	35.8	4.03	22	+ 0.13	1.14	1	

* The Rotorua station was closed at the end of May; Whakarewarewa has been substituted.



A Conservation Farming System for New Zealand Hill Country

By D. A. CAMPBELL,
Superintendent of Soil Conservation, Department of Agriculture, Wellington

NEW ZEALAND'S soil erosion and flooding problems have their origin on the hill country pastoral lands, especially where farming has forced grass to take over the protective functions of vigorous native forest, scrub, fern, and swamp vegetation. Experiments by Soil Conservation officers of the Department of Agriculture on several typical hill country farms acquired by the Soil Conservation and Rivers Control Council have provided the basis for a conservation farming system for hill country which could reduce costly erosion and flooding. The system is based on topdressing and oversowing to rebuild fertility, spelling to strengthen pastures and promote reseeding, fencing to control grazing by cattle and sheep, tree planting of eroded land, gully control, contouring of ploughable land, the construction of water control dams, and fire and pest control.

SOME 70 per cent. of the occupied agricultural land of New Zealand is unploughable pastoral land and much of this demands special conservation farming methods because of the hitherto serious deterioration, soil erosion, and weed invasion problems which beset it.

Investigation of catchment problems has revealed in general that the drastic changes in the vegetation brought about by developing farming resources have been reflected in equally drastic changes in the soil on the hill country and that soil erosion and flooding have their origin on hill country.

The protective, stabilising, and water-controlling combination of vigorous native vegetation, litter, and spongy soil has given way to a shallow-rooted, less protective, in fact threadbare carpet of grass on compacted, impervious, and often exhausted soils. The problem is one of restoring an erosion-resistant and water-absorbent combination of soil and vegetation with a satisfactory capacity to control water, which causes most soil erosion.

HEADING PHOTOGRAPH: Comprehensive contouring to control flooding on the Wither Hills, Marlborough. Tunnel-gully erosion (centre foreground), pasture furrows (left foreground), graded banks (right foreground), grassed waterway (arrow), broad base terraces (beyond arrow), stock pond on ridge.

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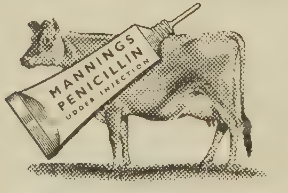

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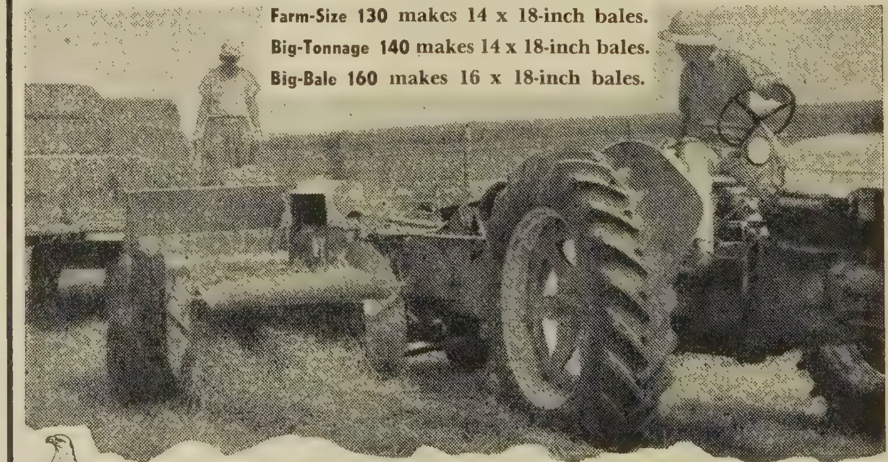

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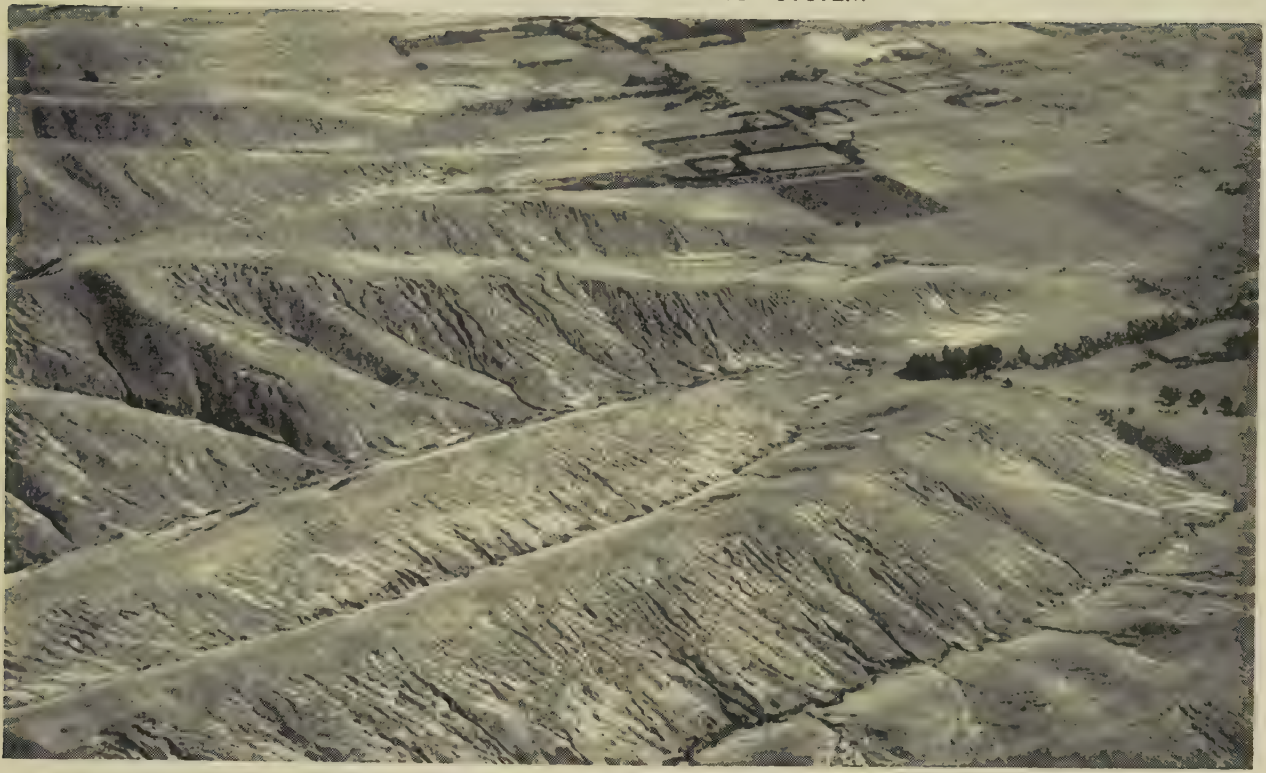


▲ Land on the Wither Hills, Marlborough, ruined by sheet and gully erosion. New Zealand Aerial Mapping photograph.

A portion of the same country → reclaimed by trees. Grass alone is incapable of stabilising the steeper and more actively eroding farm slopes.

Farms Acquired

To develop practical soil conservation methods for this problem hill country eight typical, deteriorated, and eroded farms were acquired as soil conservation reserves.

Being typical of hill country, these farms provided little scope for applying the array of well-known soil conservation practices developed in the United States for ploughable land. However, they provided ample opportunity to investigate various adaptations of the limited range of management practices available on unploughable hill country.

Experimental Work

Experimental work was undertaken to find out what combinations of suitably adapted farm management and special conservation practices were necessary to combat soil erosion and provide practical methods of conservation farming.

Because this experimental work had to produce practical answers, the units of land acquired were typical of the size of the average farm in the area. The changes in land use and modifications required in a conservation farming programme had to fit into the economic unity of the farm.

Additional experimental work was undertaken on private farms where gully, slip, sheet, stream, and wind erosion problems were tackled directly by subsidising farmers through Catchment Boards to do the work to specified standards.

By 1947, the early work on the experimental and demonstration farms together with the soil conservation works undertaken by Catchment Boards had yielded the following information and results:—

Spelling or retirement from grazing for variable periods, especially during flowering and seeding, revived both native and sown pastures remarkably, and generally produced a much more erosion-resistant and water-controlling cover on eroded lands.

Surface sowing of clovers, and even grasses under certain circumstances, resulted in surprisingly good establishment on deteriorated sown and native grasslands, particularly when grazing was strictly controlled during and after establishment.

Topdressing with phosphate and trace elements proved to be the biggest

Aerial topdressing and oversowing have been the salvation of much eroded hill country such as this in the eastern Wairarapa.

factor in promoting the introduction of clovers and the strengthening of the grasses on deteriorated and exhausted hill country soils in both the main islands of New Zealand.

Rotational grazing of cattle was more effective than sheep grazing in regenerating poor pastures, and cattle obviated the need to burn native pastures periodically. The rapid recovery of native pastures where burning and rabbits were eliminated and cattle grazing was controlled was most promising.

The value of planted trees in healing unstable eroded land, particularly in gullies, was confirmed in all districts, as was the effectiveness of native cover regenerated by complete spelling in the higher rainfall areas.

The worth of pasture furrows in conserving water and reducing scour of soil and flooding of streams was enhanced by their beneficial effect on pastures in the lower rainfall areas.

Graded banks and broad base terraces were strikingly effective in stopping the loss of soil from cultivated slopes by sheet and rill erosion, and in reducing greatly the amount of uncontrolled run-off, in all the initial trials.

Early trials proved that wide, shallow, grassed waterways could effectively dispose of excess run-off in this country, where good swards of grass were readily obtainable.

The merits of water control dams capable of storing temporarily flood waters and regulating their discharge through a pipe were also demonstrated.

Gully control works soon revealed that structures such as the various kinds of debris dams, drops, and plantings in the gully had to be supported by radical changes in the grazing management of the catchment, and by topdressing, terracing, and the diversion of the water where possible.

All these single practices were of limited value unless they were used to support each other and were backed up by constructive farm management. As they had to be used mainly on unploughable hill country, they were of limited use until the fertility of the land was built up by topdressing and oversowing. This not only increased the protective capacity of the pasture, but also increased carrying capacity and provided revenue for other improvements and supporting practices.

Thus, the only practical challenge to the almost insuperable problem of the general deterioration of hill and high country, and the foundations of conservation farming, depended basically on replenishing fertility by topdressing and oversowing with clovers.

Because of the scarcity of labour and impractical hand topdressing methods the key to conservation on the hill country was aerial mechanisation of topdressing and seeding.

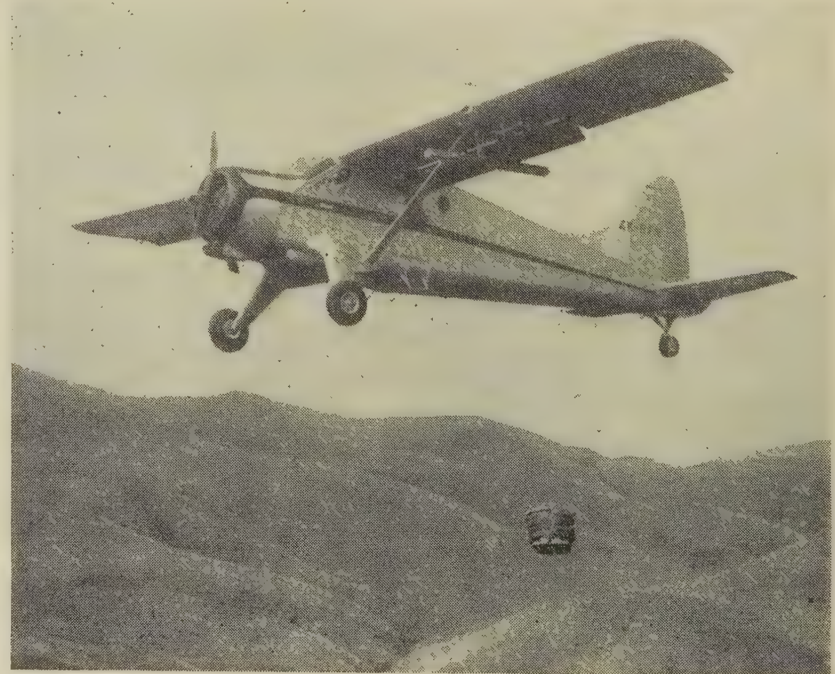
Pioneering Aerial Farming

Restoring fertility and the protective cover on pastoral lands was of sufficient urgency for the Soil Conservation Council to organise and finance aerial topdressing and seeding trials, plans for which were proposed by the author and approved in July 1947. The prospect of obtaining direct benefit to the farmer and indirect benefit to the catchment was sufficient justification to overcome what was then regarded as impossible—the economic barrier to the use of aircraft in topdressing.

Though aircraft had been used for many years overseas for spraying and seeding work and their capacity for this work had been demonstrated in New Zealand, no one was prepared to gamble on the pioneering of aerial topdressing.

In November 1947 the Soil Conservation Council called a meeting of the following Departments and organisations, which became its Advisory Committee on Agricultural Aviation—the Departments of Agriculture and Scientific and Industrial Research, the Lands and Survey Department, the Public Works Department, the Royal New Zealand Air Force, the Civil Aviation Administration, the Soil Conser-

▼ Dropping a load of four coils of wire on a drum and steel posts. Aerial dropping of fencing material on hill country has a great future.



Sheet and wind erosion and scree creep on South Island high country.

vation Council, Federated Farmers, and fertiliser manufacturers.

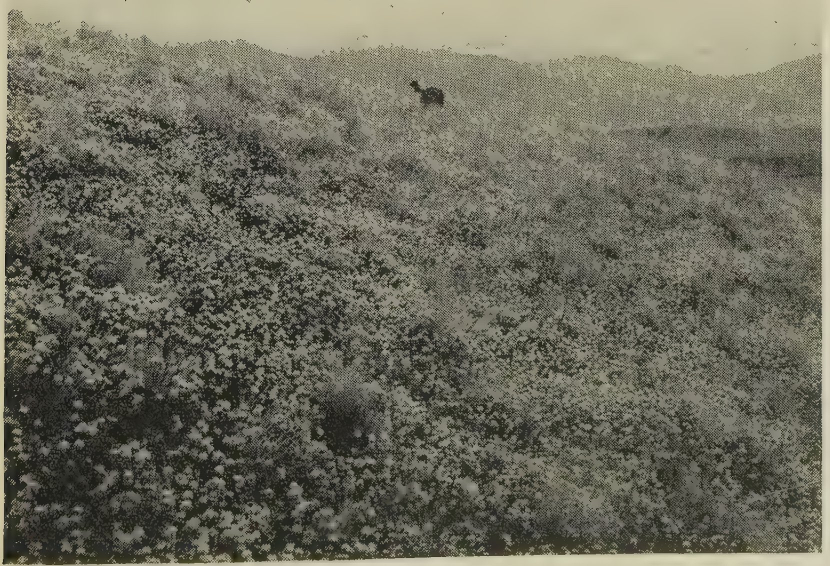
Topdressing Trials

The initial trial flights at Ohakea in September 1948 were followed by a hill country trial at Te Mata and two trials for further adjustment to the equipment at Ohakea by the R.N.Z.A.F., which adapted an Avenger aircraft and ground control equipment for the trials. A final evaluation and demonstration of an aerial topdressing service was made at a 1000-acre trial in the Wairarapa. This trial, on 10 properties at varying distances up to 30 miles from the aerodrome, was financed through the Wairarapa Catchment Board by the Council and was carried out by the R.N.Z.A.F. The technical aspects, including distribution, were measured and assessed by staff of the R.N.Z.A.F., the Soil Conservation Council, and the Department of Agriculture.

This trial created a big demand among farmers (over 100 farmers in Wairarapa alone asked for the topdressing of upward of 20,000 acres) and successfully demonstrated the capacity of aircraft to topdress and oversow hill country. A Soil Conservation Council report to the Government that an aerial topdressing service should be organised and operated by the R.N.Z.A.F. was not approved. However, just before the Wairarapa trials a small aerial topdressing contract carried out by Airwork, Christchurch, proved conclusively that small aircraft (Tiger Moths) could be used efficiently within the farm for topdressing and seeding. This trial resulted in several private operators establishing aerial topdressing on a contract basis with farmers and out of it has developed the vigorous aviation industry of today.

The Council's Advisory Committee on Agricultural Aviation adopted the plans and specifications prepared by Civil Aviation Administration for a special, safe, rugged, medium-sized aircraft for topdressing, and these ideas were incorporated in a recently manufactured aircraft. It undertook, with the Council's finance, the development of packaging, flying, and dropping techniques needed for the aerial delivery of fencing materials, and publicly demonstrated these successfully in May 1955.

⮟ Aerial sowing of 2½cwt. of superphosphate, 2lb. of alsike, 2lb. of white clover, and 3oz. of molybdenum per acre has rejuvenated this depleted tussock land at 2500ft. elevation in the Mackenzie Country, South Canterbury.



Growth of Industry

In a little over 7 years the agricultural aviation industry has grown phenomenally to 60 companies using over 300 aircraft and employing over 500 personnel. Its performance is startling; with over 5 million flights to its credit it has contributed the equivalent of upward of 3 million man-days of work in improving hill country.

The 1¾ million tons of fertiliser distributed on the equivalent of 12 million acres of hill country have contributed considerably to the 20 per cent. increase in sheep and cattle numbers over the period. Over 1000 tons of clover seed have been introduced into hill country pastures. The 14,000 tons of rabbit poison dropped on deteriorated and rabbit stricken country have reduced the pest to a stage where follow-up methods to eliminate it are now possible. Three thousand tons of weed spray distributed on pastoral hill country have contributed greatly to improved pastures by controlling thistles in particular.

The dropping of fencing supplies is only in its infancy, but it has a great future, as the subdivision fencing required by hill country (approximately 1 chain per acre of improved hill country) lags behind and requires, it is estimated, some 100,000 tons of fencing material a year.

Conservation Farming System

The results of the early experimental work on the Council's Soil Conservation reserves have been combined to support each other in comprehensive practical farming programmes on each of the Council's 8 properties. This has resulted in the formulation of a conservation farming system that can be adapted to the needs of various districts. This programme is based on suitable combinations of the following:—

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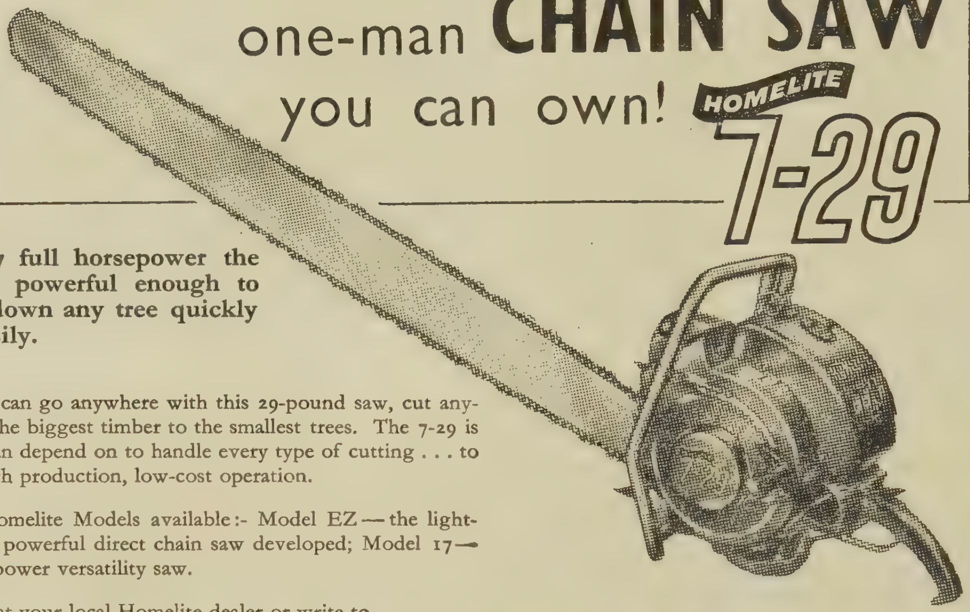

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SOIL CONSERVATION . . .

1. Restoring fertility and improving hill country pastures by aerial topdressing, seeding, weed spraying, and rabbit poisoning. The effects of this programme are evident in greener and more productive hill country pastures.

These operations must be supported by other equally important conservation measures and be restricted to relatively stable land suited to farming if increased soil erosion and run-off are to be avoided.

2. Grazing is the most powerful factor affecting hill country farming. Complete spelling for various periods, including the seeding period, has increased soil protection, control of water, and subsequent production on both North Island and South Island hill country.

Predominantly cattle grazing has been most helpful in the initial improvement of deteriorated native and sown pastures, in controlling roughage, and in strengthening clovers and the better grasses.

The judicious combination of cattle and sheep grazing on hill country on a rotational, or deferred grazing and spelling system, or mob stocking basis over portions of the year is highly desirable in the promotion of conservation. It reduces trampling and consolidation and consequently increases the ground's capacity to absorb rainfall, while the greater bulk of vegetative cover protects the soil from drying out and from erosion.

3. Trees to protect and stabilise land are essential in a conservation farming system. Grass alone is incapable of stabilising the steeper and more actively eroding farmed slopes; trees planted singly and in groups restore the stability of many grassed slopes. Various combinations of grasses and deciduous trees (willows, poplars, and false acacias), used according to the severity of erosion, promise to increase the utilisation of marginal land where the spacing varies from open, scattered planting on the more stable land to the close planting of unstable land.

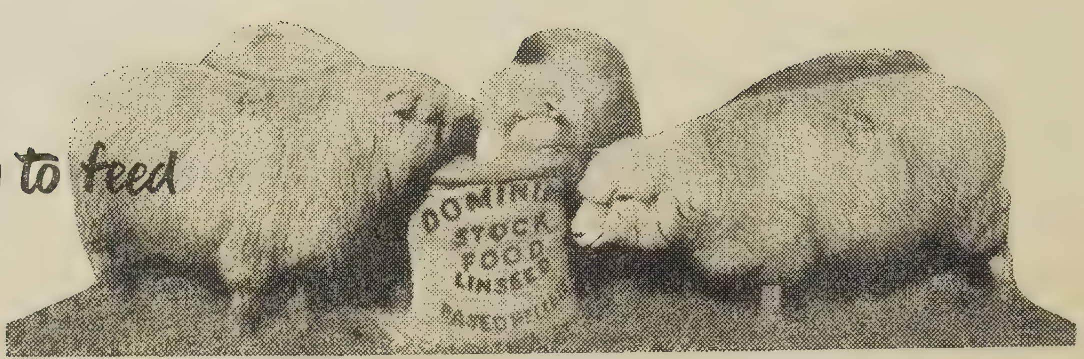
In the higher rainfall districts natural regeneration of shrubs and later forest trees is so effective that fire control and fencing to protect such land from livestock are fully justified.

4. Probably the most outstanding conservation practice is contouring, which consists of the construction of furrows, banks, or terraces on the true contour or on a slight grade to control the movement of soil and water and to conserve both. It also includes cultivation along the contour, which reduces the rate of movement of soil and water downhill.

A dual-purpose water control dam in Poverty Bay. Such dams can be used for storing extra stock water and to supplement irrigation and fire-fighting supplies.

Spaced planting of trees helps to stabilise hillsides in the Rangitikei district.

A grassed waterway in North Canterbury discharging water slowly from the graded banks in the background.



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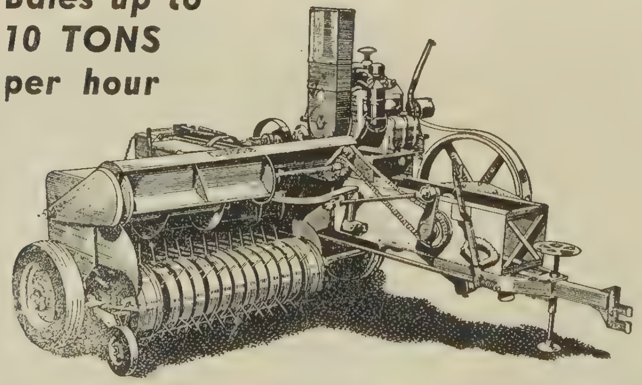

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▲ Preventing erosion by contour furrowing at Omakere, Hawke's Bay.

5. The dams necessary in many cases to control gully erosion and to retard the flow of flood water from small catchments are an example of the importance of combining soil conservation and engineering techniques in any comprehensive soil erosion and flood control programme.

Good progress has been made in hundreds of gully control projects, in co-operation with farmers, using a combination of pasture improvement, contouring, grazing management, tree planting, and debris damming practices, and the best results have been achieved where these have been used to support each other. This work is now being supported by the construction of dams in the head waters of gullies to regulate flow and minimise scour as much as possible during floods.

In suitable catchments storage dams are becoming popular for extra stock water, and they can also be used to supplement irrigation and fire fighting supplies.

6. Fire and pest controls are important conservation practices in many parts of the hill country, though a great deal has been achieved by bylaws restricting burning of native grass to spring when the soil is wet. Much remains to be done in some places in developing effective alternatives to burning, with the greater use of cattle, topdressing, and seed sowing.

The remarkably successful killer campaign waged by the Rabbit Destruction Council through Rabbit Boards promises to lead to the elimination of a most damaging pest. Other pests such as deer, wallabies, goats, opossums, and wild pigs still challenge the farmer's ingenuity and industry, though progress is being made toward organised control.

Pasture furrowing on the true contour, as has been done here in the Hakataramea Valley, North Otago, or on a slight grade controls the movement of soil and water to conserve both. →

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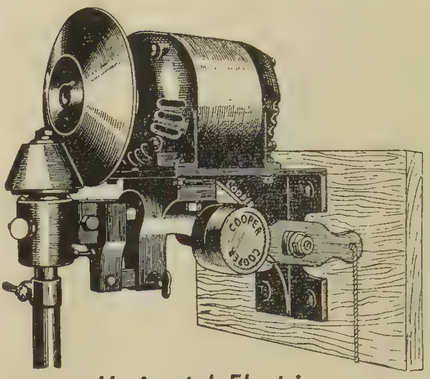

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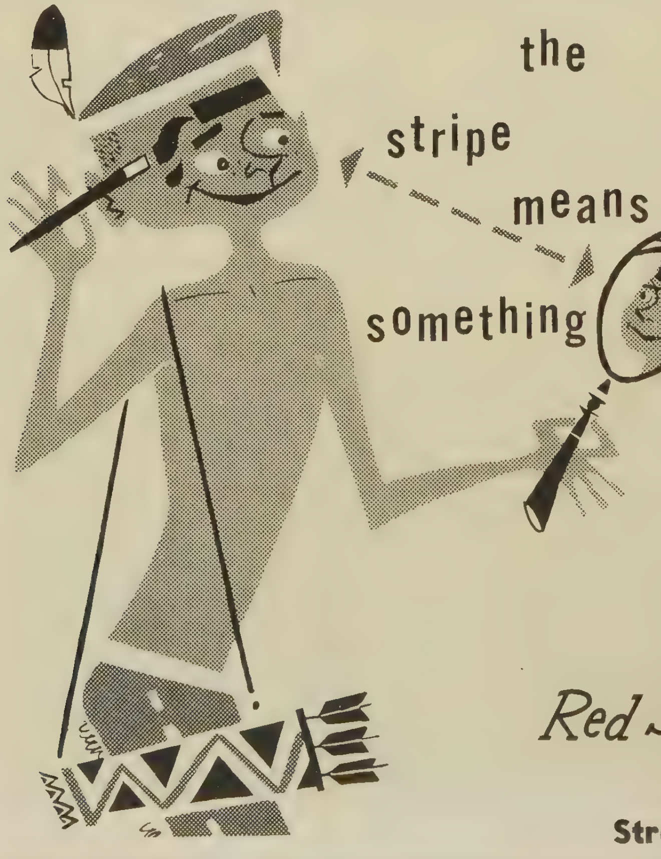

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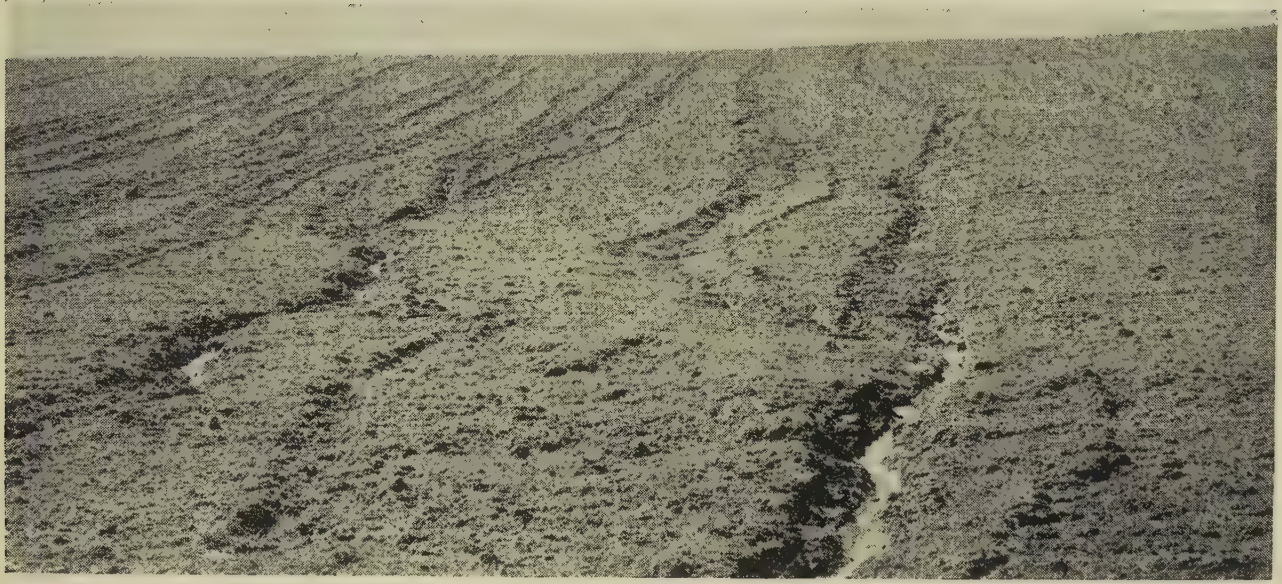


▲ Sheet and rill erosion in South Canterbury.

▼ Light discing on the contour and pasture furrowing ensure the establishment of oversown clovers on the strip in the foreground, compared with the untreated strips in the background on steep, low rainfall country in the Wither Hills, Marlborough.

Promotion of Subsidies

Subsidies are normally available for approved conservation works on a £1 for £1 basis on farm lands for the following:—

Conservation Fencing

Grazing control is so fundamental in recuperating and maintaining protective swards that the cost of materials is subsidised where it can be established that soil erosion and run-off will be reduced progressively by increased fencing and consequent improved management.

Tree Planting

Trees play such an important role in protecting land from wind erosion and in anchoring and stabilising steep lands that the cost of suitable trees and the fencing required to protect them from livestock is subsidised. Subsidy can also be claimed for the cost of fencing bush and scrub covered land to promote regeneration if the farmer is prepared to retire unstable and eroding lands from grazing.

Contouring

Pasture furrows, graded banks, broad base terraces, diversion terraces, and grassed waterways are so effective in reducing flood-producing run-off and soil erosion, conserving water, and increasing pasture and crop production that the cost of the work is subsidised.

▲ Balanced sheep and cattle grazing at Rewa, in the Rangitikei district. A rotational or deferred grazing and spelling system or mob stocking basis is highly desirable, as it reduces trampling and consolidation and consequently increases the ground's capacity to absorb rainfall.

▼ An A frame of willows and netting makes an effective debris dam for gully control.

Dams

Dams are subsidised according to the service they perform in flood control, ranging from a 3 to 1 subsidy when the dams are used exclusively for flood control to a 1 to 1 subsidy when they are used for stock water and irrigation as well.

Gully Erosion Control

A 2 to 1 subsidy is available for comprehensive planned treatment of gullies and their catchments.

Farm Conservation Schemes

Farm conservation schemes are further encouraged in special cases by assistance with the initial sowing and fertilising of badly depleted lands. A land capability survey is made and a conservation farming programme, geared to the resources of the farmer, is prepared for a 5-year period, while the various practices are subsidised on the basis given in the foregoing.

Catchment Control Schemes

The adverse effects of floods on more heavily populated and more productive lowlands have led to the urgent treatment of some particular trouble spots, but long-term soil erosion and flooding programmes must work from the hill and mountain tops down the catchments to the rivers and to the sea.

The goal of soil conservation is the application of conservation schemes on every farm in a catchment. Greater protection and control can be obtained in closely integrated schemes where gullying and flooding often affect several farms. Farmers can do only a limited amount of effective control individually, but collectively they can restore completely balanced control and full use of the soil and water resources.

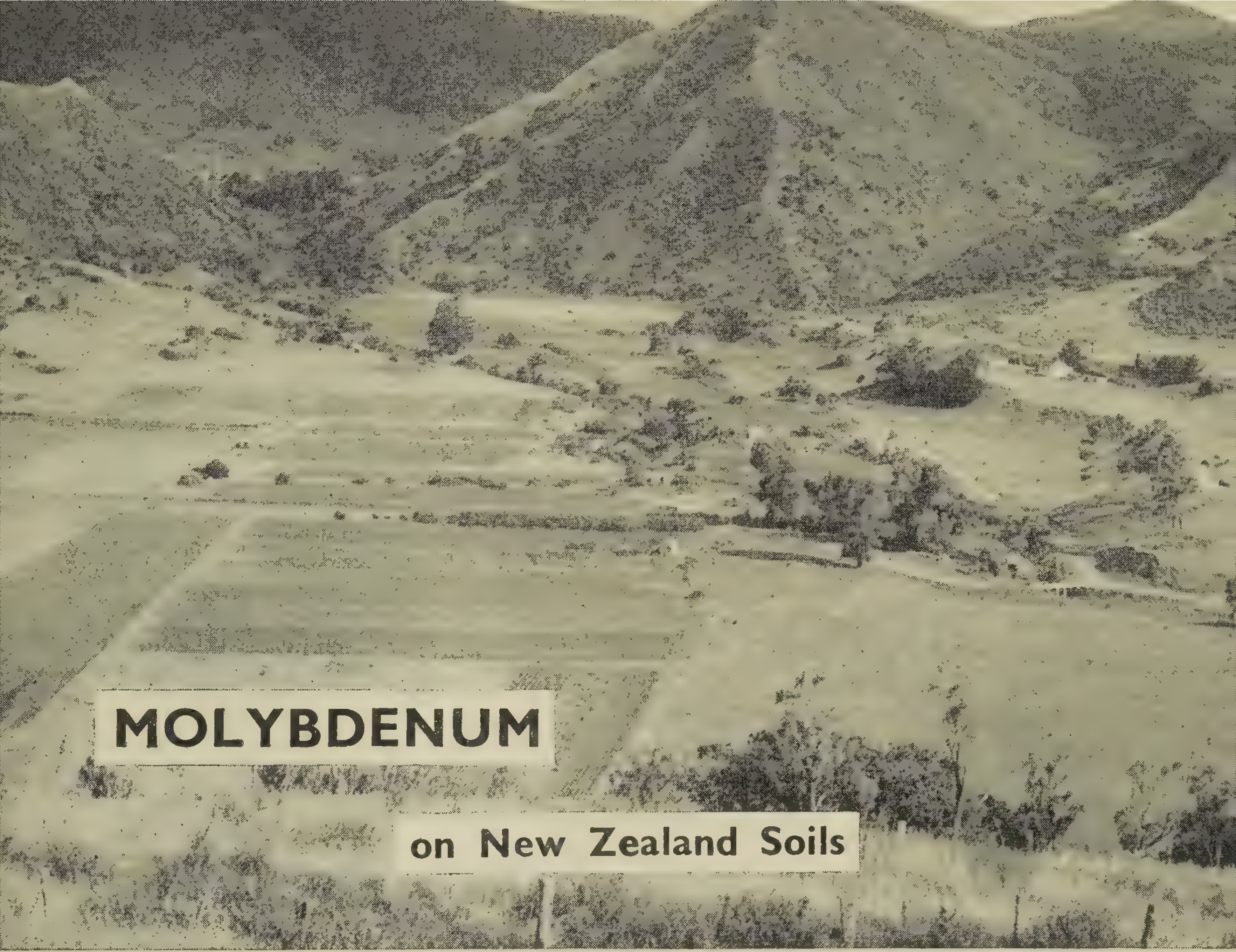
Such a scheme applied to several farms is working admirably in the Glenmark Catchment in Canterbury by minimising soil erosion and flooding as well as doubling pasture production on most of the land.

The Council and the Department of Agriculture promote the widespread adoption of conservation farming by giving technical assistance to farmers who undertake soil conservation, and by means of subsidies through Catchment Boards.

Further information on conservation work and the assistance available can be obtained from officers of the Department of Agriculture and from Catchment Boards.

MOLYBDENUM

on New Zealand Soils



A view near the Rawene-Opononi road south of Hokianga Harbour. Across the valley is a typical reverting pasture on a steep, semi-volcanic soil. The soil type is Te Kie loam. Sparrow photo.

Basalt and Andesite Rock Soils of Auckland Province

THAT the application of molybdenum might be of value in New Zealand was first suggested by E. B. Davies, Senior Chemist, Department of Agriculture's Rukuhia Soil Research Station, when he found in 1945 that whiptail disease of cauliflowers noticed in a Wellington suburb was associated with a deficiency of molybdenum (1). Subsequently experiments were laid down in pastures on nearly all major soil types, with the result that knowledge of the distribution of molybdenum-deficient soils is now far advanced. In this article, the second of a series which will appear periodically in the "Journal", N. A. Clarke, formerly Instructor in Agriculture, Department of Agriculture, Kaikohe, and H. G. B. Halliwell, Instructor in Agriculture, Department of Agriculture, Kaitaia, discuss molybdenum requirements of Auckland Province soils derived from basalt, andesite, and dolerite. The first article, in the July issue of the "Journal", dealt with Auckland Province soils derived from sandstone, mudstone, and limestone.

THE soils derived from basalt are popularly known as volcanic soils. As the older and most leached of these are prominent because of the accumulation of iron nodules in the subsoils, they are popularly known as ironstone soils.

The soils derived from andesitic rock flows and steep formations of doleritic rock are popularly known as semi-volcanic soils.

In this article the value of molybdenum will be discussed on a soil type basis, beginning with semi-volcanic soils and followed by volcanic and ironstone soils.

Semi-volcanic Soils

More accurately the semi-volcanic soils are described by the Soil Bureau,

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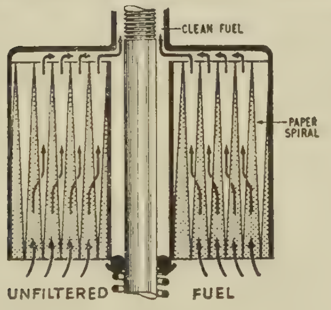

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Department of Scientific and Industrial Research, as brown granular loams and clays. They are brown soils derived in a few instances from dolerite rock, but most commonly from andesitic rock flows and from alluvia derived from andesitic material.

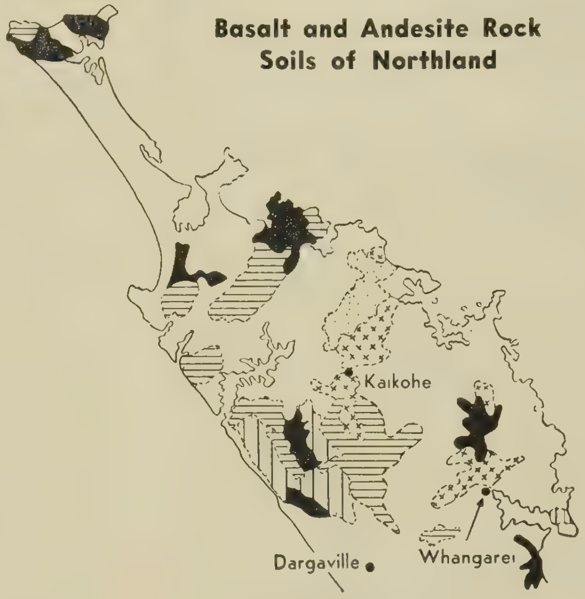
Semi-volcanic soils are located in large blocks east of Kaitaia from Doubtless Bay to Whangaroa Harbour. They are also present as blocks in the Te Kao and Te Paki areas in the far north. South of Kaitaia they form the Mangamuka Ranges. South of Kaikohe there is an area of semi-volcanic country of about 300,000 acres. This area is bounded by Tautoro and Waipoua Forest to the north and Kaihu and Parakao to the south. Several ranges running from north to south dissect the area into a number of valleys. The elevation mostly varies from 550ft. to 1100ft., but rises to nearly 2000ft. in Waipoua Forest.

Rivers fed by these bush-clad, andesitic ranges have deposited volcanic material in alluvial flats and terraces. For instance, the soils of the Kaitaia flats contain much andesitic material. The brown granular clays and loams cover quite a large area, about 600,000 acres in all, of which 100,000 acres are easy rolling, 300,000 acres are medium steep, and 200,000 acres are very steep and of little potential value for farming.

The easy rolling soils (Rangiuru, Awarua, and Aranga clays) have long puzzled farmers and agriculturists because of their infertility and because they defied worthwhile development by the orthodox means of applying superphosphate, lime, and potash. The pastures quickly reverted to dominant browntop-danthonia swards practically devoid of clover and capable of carrying about ½ sheep to the acre. Only heavy dressings of lime, particularly if combined with applications of basic slag, produced reasonable pastures.

With present knowledge facts such as these point to molybdenum deficiency, and it is therefore not surprising that in experiments and later in practice this trace element has given outstanding results on almost all soils derived from andesitic parent material. In many cases the use of molybdenum combined with superphosphate and some lime and perhaps potash may double or even treble carrying capacity. The sheep-carrying capacity in certain paddocks on these soils has already been trebled with one application of molybdenum. On one farm butterfat production has increased from 10,500lb. to 21,000lb. in 1 year with the same number of cows. Another farmer in the Awarua district with the help of molybdenum and pasture oversowing last season milked 75 cows on 250 acres with a winter run-off on part of a farm which previously ran 200 sheep and about 40 Polled Angus cattle on 1000 acres. Thus districts regarded until now as containing only submarginal land, largely reverted to scrub, can now be developed economically into thriving centres of fat lamb or even dairy production.

On Coromandel Peninsula outstanding responses to molybdenum on semi-volcanic soils have also been obtained.



Basalt and Andesite Rock Soils of Northland

SEMI-VOLCANIC SOILS

■	Flat to easy rolling, but partly hilly to steep, particularly in the North Cape area. Need lime as well as molybdenum.
▥	Mainly steep, but partly suitable for farming. Can be farmed with little or no lime.
▤	Very steep, mainly bush covered and largely unsuitable for farming.

VOLCANIC SOILS

✕	More fertile; a small proportion responds to molybdenum topdressing.
░	Ironstone.

[*Adapted from a 1948 soil map of New Zealand of the Soil Bureau, Department of Scientific and Industrial Research.*

The rate at which molybdenum should be applied on the semi-volcanic soils of North Auckland and Coromandel is not exactly known. Sodium molybdate at 2½oz. per acre has given good results in all but one field experiment.

In spite of the good response to molybdenum, the use of lime is still recommended, but the very heavy rates previously considered essential to produce good pastures are now thought to be unnecessary. The use of lime on the steeper, immature soils is limited by their topography (for instance, Te Kie stony loam); these soils, however, are not very acid. The same may apply to soils derived from recent alluvia. On the more mature soils of the easier slopes 10cwt. to 15cwt. of lime and 2½oz. to 5oz. of sodium molybdate per acre is now recommended instead of the 2 to 3 tons of lime per acre favoured previously. Molybdenum responses on the brown granular clays have also been observed on swedes, turnips, chou moellier, rape, corn, and pumpkins. Swedes of up to 19lb. have been grown on a field sown with molybdenum superphosphate when broken in from virgin country.

Nevertheless, the use of a nitrogenous fertiliser in addition to molybdenised superphosphate on swedes and other crops may have merit on some of the poorer northern soils. Molybdenum does not reduce the need for nitrogenous fertilisers.

The semi-volcanic soils respond somewhat characteristically to molybdenum. The usual pattern is a marked initial increase in the growth of clovers, either as trefoil, *Lotus uliginosus (major)*, subterranean clover, or red clover and white clover, depending on fertility levels and species grown previously. However, ultimately the sward becomes white clover dominant and eventually perennial ryegrass will become prominent if originally present in an unthrifty form. Palatability of the topdressed area increases and stock graze preferentially the treated areas. This increase in palatability is often the first sign of a molybdenum response.

Effect on Stock Health

Pastures of brown granular loams and alluvia derived from andesitic parent material have a satisfactory copper content (7 to 13 parts per million of dry matter) (2) and a low molybdenum content (usually less than

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1 p.p.m.). On the results available so far topdressing with 2½oz. or 5oz. of sodium molybdate per acre has not raised the molybdenum content of pastures much above 1 p.p.m. Five ounces of sodium molybdate is equivalent to the molybdenum content of 6cwt. of molybdenised superphosphate. One word of warning, however, is necessary. It has been shown by Dr. I. J. Cunningham that immediately after the application of molybdenum the amount of this element in the herbage may rise steeply and fall gradually a few months after application. The Department of Agriculture has no information on molybdenum levels of pasture a few weeks or months after application. For this reason, even on these relatively "safe" soils farmers are cautioned not to use more molybdenum than is necessary to obtain optimum growth.

Volcanic Soils

The so-called volcanic soils are derived from basalt and basaltic scoria. Fairly large areas occur north and west of Whangarei and south and east of Kaikohe. The citrus orchards of Kerikeri are situated on the more leached and mature soils of this group.

MORE IMPORTANT SOIL TYPES AND THEIR REACTIONS TO MOLYBDENUM

Soil type	Topography	Reactions
Semi-volcanic soils		
Mangakahia loam	Flat	No experiments, but paddock trials have shown response (recent alluvium).
Kaitaia clay loam	Flat	Good molybdenum responses. May need 5oz. of sodium molybdate per acre. Generally it is about 10 months before responses show, but this may depend on time of application of sodium molybdate in relation to the beginning of spring clover growth
Awarua clay Rangiuru clay Pakotai clay	Easy rolling	Excellent response to molybdenum. Appear to need 5oz. of sodium molybdate per acre initially.
Kohumaru clay	Mainly flat	Excellent response to molybdenum.
Tutamoe clay Aranga clay	Undulating	No experiments, but good response to molybdenum is probable.
Mangonui clay	Rolling	Excellent response to molybdenum.
Waimatenui clay	Rolling	Excellent response to molybdenum. Appears to need 5oz. of sodium molybdate per acre initially.
Waimamuku bouldery clay (complex)	Rolling to hilly	Good response to molybdenum.
Onetai clays and loams (complex)	Rolling to hilly	Fair response to molybdenum.
Whatoro clay	Easy rolling	Excellent response to 2½oz. of sodium molybdate per acre in one trial.
Takitu clay Katui clay	Mainly hilly	Much reverted to scrub. Not enough experiments, but molybdenum responses are likely.
Awapuku clay	Rolling to hilly	Excellent responses to molybdenum, but about 12 months may elapse after the application of molybdenum superphosphate before responses show, particularly on poor, sodbound paspalum. May require 5oz. of sodium molybdate per acre.
Te Kie (red brown phase)	Hilly to steep	Excellent response to molybdenum. May need 5oz. of sodium molybdate per acre for best results.
Volcanic soils (derived from basalt)		
Kerikeri friable clay	Gently undulating	Very slight pasture responses.
Taraire friable clay	Gently undulating	Very slight pasture responses.
Ruatangata friable clay	Undulating	Very slight pasture responses.
Ironstone soils		
Okaihau friable clay	Gently undulating	Very slight pasture responses

A coastal farm on Coromandel Peninsula. The soil type is Awapuku clay, a semi-volcanic soil derived from andesite and developed under a moderate rainfall of about 50in. Molybdenum is expected to bring increased prosperity to the superbly scenic Coromandel district.

A view from Maunu Hill toward Maungatapere Hill near Whangarei. Showers from these basaltic volcanic cones have formed relatively fertile soils on which pastures do not seem to respond to molybdenum.

Pastures on the soils found at Kerikeri (Kerikeri clay loam) and pastures on a small number of other soil types which are fairly leached (about 30,000 acres) are responding very slightly to molybdenum, but the comparatively small effect of molybdenum on these soils and the fact that major improvement can be effected with phosphate, lime, and potash has not encouraged the use of molybdenum.

The levels of copper in the herbage of pastures on these volcanic soils derived from basalt seem satisfactory (2), with an average of about 10 p.p.m. of dry matter. The molybdenum content of untreated pastures is low, usually below 1 p.p.m.

Ironstone Soils

The ironstone soils are derived from the same parent material (basalt) as the so-called volcanic soils. Greater age, however, has led to more severe leaching and to the gradual formation of iron nodules, giving, in extreme cases, a soil of gravelly appearance (Okaihau gravelly clay).

The only large block of ironstone soils (about 70,000 acres) occurs west and north-west of the Bay of Islands. The Department of Lands and Survey and private farmers have broken in a considerable proportion of it in the last few years. Experiments with molybdenum have shown slight increases in the growth of pastures. If lime, superphosphate, and potash are applied at the recommended rates, however, the use of molybdenum does not give much improvement. Pasture copper levels on the ironstone soils are satisfactory if somewhat variable, ranging from 6 to 12 p.p.m. of dry matter in 20 samples examined (2). Molybdenum levels of untreated pastures are very low.

Summary

Pastures and crops on nearly all the soils derived from andesitic parent material gave outstanding responses to molybdenum. The use of up to 5oz. of sodium molybdate per acre (as contained in 6cwt. of molybdenised superphosphate) is recommended, but no more is advised. No adverse effects on stock health are expected after the recommended rate of application, except perhaps where there has been very heavy liming in the past.

Though pastures on a number of soils derived from basalt do respond slightly to molybdenum, its use is of relatively slight benefit on well-manured fields. Further, the regular use of molybdenum on this group of soils (Kerikeri clay loam, Ruatangata friable clay, and Okaihau friable clay) could lead to stock poisoning unless copper is applied to counteract the toxic effects of molybdenum.

REFERENCES

1. E. B. Davies, "Nature", vol. 156, page 392, 1945.
2. I. J. Cunningham, unpublished data.

Main Wool Sales

The dates and venues of main wool sales until the end of 1957 are:—

23 and 25 October: Dunedin.
30 October: Christchurch.
8 November: Auckland.
13 November: Wanganui.
18 and 20 November: Napier
25 November: Wellington.
4 December: Christchurch
9 December: Invercargill
14 December: Dunedin
18 December: Timaru

Grow Your Own Christmas Tree

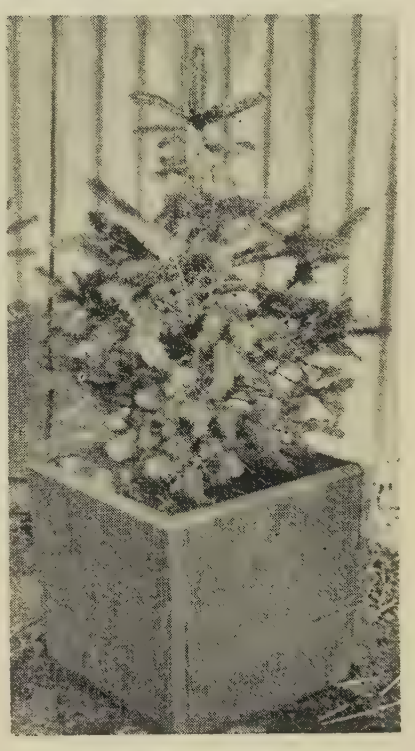
MOST Christmas trees in New Zealand are made from the branches or tops of pine trees, which are not satisfactory because they wilt quickly, are often not straight, and have too long needles that tend to cover the decorations and make the use of lighted candles hazardous. For best results a live tree in a container should be used, and this article by K. H. Marcussen, Horticulturist, Department of Agriculture, Christchurch, describes how such a tree should be selected and grown. To be ready for use at Christmas these trees need to be tubbed now.

THE trees used in England and on the Continent for Christmas trees are usually spruce (*Picea* sp.), or fir (*Abies* sp.), both of which are ideal. They taper to the top, the branches are placed fairly evenly, and the needles are short.

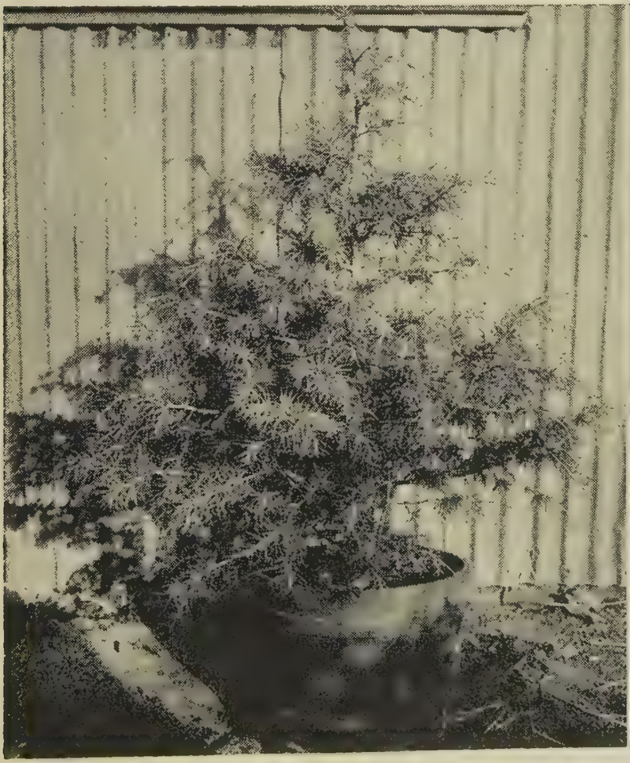
In the Northern Hemisphere Christmas falls at midwinter, when the past season's growth of coniferous trees has matured and the trees are fairly dormant. The trees can therefore be cut several weeks before they are required; in fact cut trees are offered for sale from early December and are still in good condition until after the festival.

That is not so in this country. The trees are in active growth and almost immediately a tree, or portion of one, has been cut the young shoots start to droop. Many Christmas trees are simply cut from trees in a pine plantation or a shelter belt without any consideration being given to the fact that the trees have been planted there for a purpose and that the damage done may spoil the proper development of the trees that are cut. In recent years it has been possible to buy pine trees or branches from various sources, and young Douglas firs have also been offered for sale. This is a progressive move and it is hoped that there will be further development of growing trees specifically for the Christmas trade.

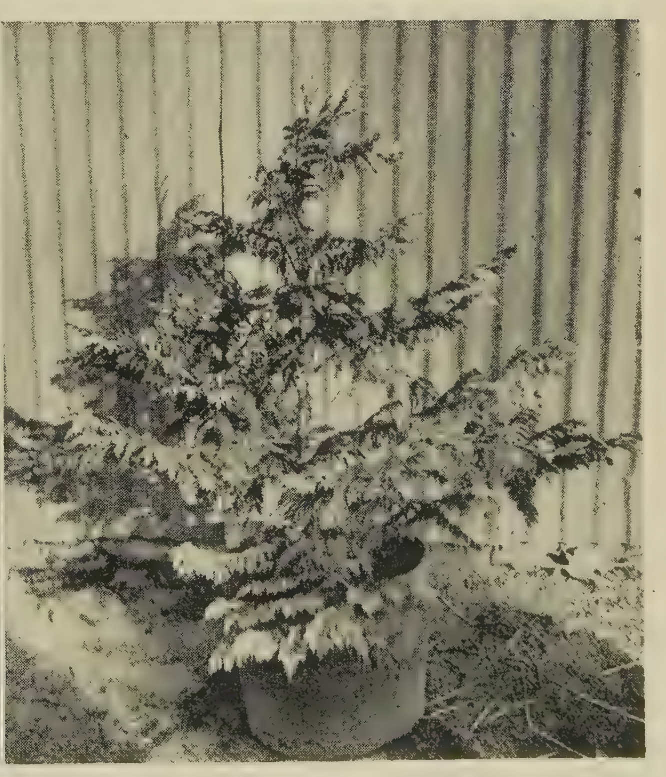
However, if a Christmas tree is grown in a container, a suitable tree is assured and the problem of wilting will be overcome. The tree can be brought in for decoration just when required and will look fresh during the whole time it is in use. It can be kept for a number of years, and if a good type of tree is used, it can provide an attraction elsewhere during the rest of the year.



Spanish fir (*Abies pinsapo*). →



Deodar cedar (*Cedrus deodara*).



Lawson's cypress (*Chamaecyparis lawsoniana*).

GROWING CHRISTMAS TREES

Douglas fir (*Pseudotsuga taxifolia*).

Suitable Trees

Spruce and fir, the trees mainly used in Europe, are available from New Zealand nurserymen. Probably the best is the Spanish fir (*Abies pinsapo*), which has very compact and sturdy growth with balanced placing of the branches. Being slow growing it lasts for many years in a tub.

The cheapest tree to buy and the quickest to develop is the Douglas fir (*Pseudotsuga taxifolia*), known also as the Oregon pine. For this purpose it may not be quite as good as the *Abies*, but very satisfactory results can be obtained. Douglas fir is not very long lived in a container, but a life of at least 4 to 5 years can be expected.

The cedars make excellent tub trees, especially the deodar cedar (*Cedrus deodara*), with greyish needles and slightly drooping branches. This tree is very suitable for use as a Christmas tree and lasts well in tubs.

Various Lawson's cypresses (*Chamaecyparis lawsoniana* sp.) can also be used for Christmas trees and are often grown in tubs for decorating terraces, yards, and gardens. The most suitable are those with fairly open habit and green colour. For decorating as Christmas trees radiata pine is not as good as the other conifers.

Containers

Any type of container is suitable for growing trees provided it allows free drainage; if necessary, holes should be made in the bottom. No container should be too deep in relation to its width, as this will increase the weight without comparable benefit to the tree.

Four-gallon tins which have been cut partly down are useful for a few years, after which the trees can be transferred into larger containers. They can be painted or covered when brought into the house.

The wooden barrels in which grapes are imported have proved excellent provided they are treated with a wood preservative some weeks before use.

Many other types of containers are available from seedsmen and horticultural stores and may be considered worth purchasing.

Soil Mixture and Tubbing up

The main consideration in the making of a mixture for tubs is that the soil should not pack too hard and that it should contain sufficient plant food.

The best soil available should be used and this should be mixed with well-rotted animal manure or compost. The soil placed round the roots should not be too rich; but because the trees are to remain in the container for some years a richer mixture should be used in the bottom: this will prove beneficial in later years and keep the plants healthy. Coarse, sharp sand should also be used in the mixture to assist in keeping the soil open. A layer of rubble, rough stones, or crocks should be placed at the bottom to prevent the drainage holes being blocked.

The soil should be made rather firm; a short piece of broom handle makes a good rammer. The container should not be completely filled; allowance should be made for an occasional top-dressing apart from adequate space for watering.

Trees which will be used for Christmas trees do not require much attention apart from watering. Details on the care and maintenance of plants in boxes and tubs will shortly be published in the "Journal".

Y. F. C. Farm Safety Officers' Activities Merit Full Support

BETWEEN 1949 and 1956 a total of 367 persons died in New Zealand as a result of farm accidents of all kinds. This striking illustration of the urgent need for a great extension of farm safety education throughout New Zealand was given to 28 young men, all members of Young Farmers' Clubs, who attended the first farm safety course organised by the National Safety Association of New Zealand at Canterbury Agricultural College in June.

THE men who gave up a week to study farm safety are some of those who have been appointed district farm safety officers in the Y.F.C. federation, whose 360 clubs are organised into 45 districts.

Each district has between two and 15 clubs and aims to have one to three trained farm safety officers. The campaign for greater safety on the farm should gain much from the activities of these young men who are in daily touch with those most exposed to farm risks.

Diverse Instruction

The course lecturers were drawn from the National Safety Association, the Departments of Agriculture, Labour, Health, and Transport, Canterbury University College, Canterbury Agricultural College, Christchurch Fire Board, North Canterbury Power Board, and the Royal Life Saving Society.

The students gained a mass of useful information and saw practical demonstrations of safety measures with tractors, farm animals, firearms, fires, poisons, infection on the farm, shafts and belts, driving on the road, implements and vehicles, and electricity and of first aid and child safety.

The course emphasised methods of telling the farming community about safety measures and the most effective organisation of public meetings and demonstrations to promote farm safety.

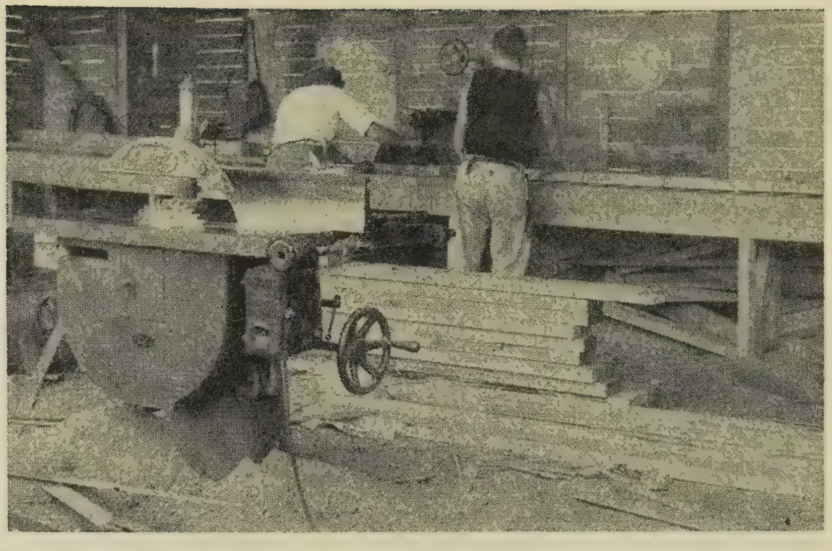
In their efforts to encourage safer working methods the district farm safety officers will have the backing of the Y.F.C. federation and officers of the National Safety Association, the Department of Agriculture, and other Government Departments whose work impinges on farm safety, and of local bodies and other organisations.

The 28 Young Farmers who attended the first course at Lincoln are a public-spirited group of young men who are giving their time and enthusiasm to counter a grave drainage of the national resources and a cause of great pain and personal loss. Their activities should merit the active support of every farmer and every rural resident.

Farm Building Construction

By H. W. T. EGGERS,
Engineer, Department of Agriculture,
Wellington

PREVIOUS articles in this series have dealt with foundations, framing, roofing materials, sheathing, and flooring. This article discusses, first, joinery, which beside providing light and access to a building also encloses it and, secondly, internal finishing materials.



WINDOWS and doors in the outside walls of a building not only must provide light, ventilation, and access, but must give complete weather protection to the inside.

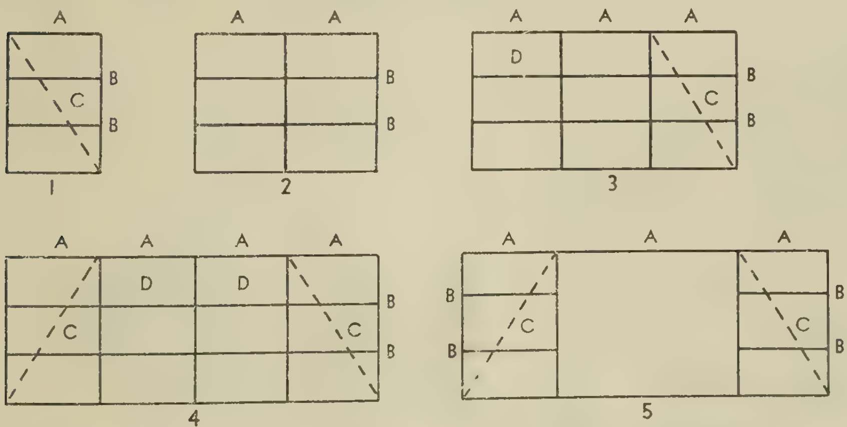
The provision of light is arranged by use of transparent or translucent materials for sections of the building where light entry is desired. This presents no problem, as the section of transparent material can be sealed watertight with the normal sheathing.

An example of this is the use of corrugated transparent plastic sheets in conjunction with corrugated roofing materials to serve as skylights. These sheets are available in the same sizes and corrugations as regular corrugated roofing sheets, either galvanised iron or aluminium, and are incorporated in the roof by being substituted for an ordinary sheet of roofing material in any place where lighting is required.

Built-up skylights glazed with reinforced glass are also available for similar installation, but are suitable only for galvanised iron roofing.

However, when ventilation or access as well as light is required waterproof sealing is not feasible and the entry of water must be prevented by deflection. This is done by the provision of steps, weather grooves, and cover plates in the frames of the movable sections or on the sections themselves. The frames of windows and doors can be sealed to the sheathing and any moisture entering round the edges of doors and windows is trapped in the weather grooves and does not penetrate to the inside of the building.

Internal joinery consists of doors and slides only and is naturally not provided with sealing arrangements to exclude the weather. Internal doors that may be required to admit light may have glass in their construction.



Method of recording window details. 1—A single-light, 2-bar, opening window. 2—A 2-light, 2-bar, non-opening window. 3—A 3-light, 2-bar window with one light opening and one light "split" or with fanlight. 4—A 4-light, 2-bar window with 2 opening lights and 2 split lights. 5—A 3-light window with two 2-bar opening lights and a landscape window; bars have been omitted in the centre portion to give the landscape window. Lights are shown by A, bars by B, opening lights and hinged sides by C, and split lights or fanlights by D.

Joinery Sizes

A previous article in this series mentioned that building joinery is essentially a factory product. Joinery can be obtained in stock sizes at an appreciable reduction in cost in comparison with special sizes, which cannot be jig produced. The provision of bars in windows also reduces the cost, as a lighter-weight glass can be used. Table 1 gives the stock sizes of doors and windows and the sizes of openings required to accommodate the frames, fitting of which was described earlier in this series.

The depth of door or window frame must be equal to the full depth of the wall in which it is placed, including stud and outside and inside sheathing. External joinery may have the facing boards attached or may be obtained without facing boards. If facing boards are omitted, the weatherboarding or sheathing must be butted close up to the frames and a cover piece, scribed to the sheathing, nailed to the frame. Frames of this type are best fitted into the building framework before sheathing is begun, whereas frames with cover boards are best placed after sheathing has been completed.

Method of Ordering

Joinery manufacturers work to simple nomenclature, and diagrams used in ordering greatly help them to interpret requirements correctly.

Window sections are known as lights, and the number of lights to a frame determines its length.

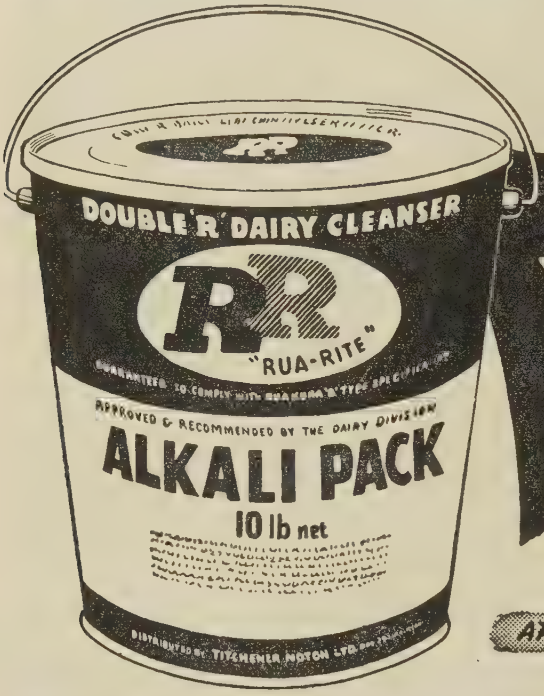
Where a fanlight is provided in a section the section is "split".

The diagrammatic method of recording requirements is shown in the illustration at left.

Joinery can be supplied "hung" or "unhung". If it is hung, the movable sections are hinged and mounted in the frames at the factory and then removed for transport. If it is unhung,

8 out of 10

N Z. FARMERS USE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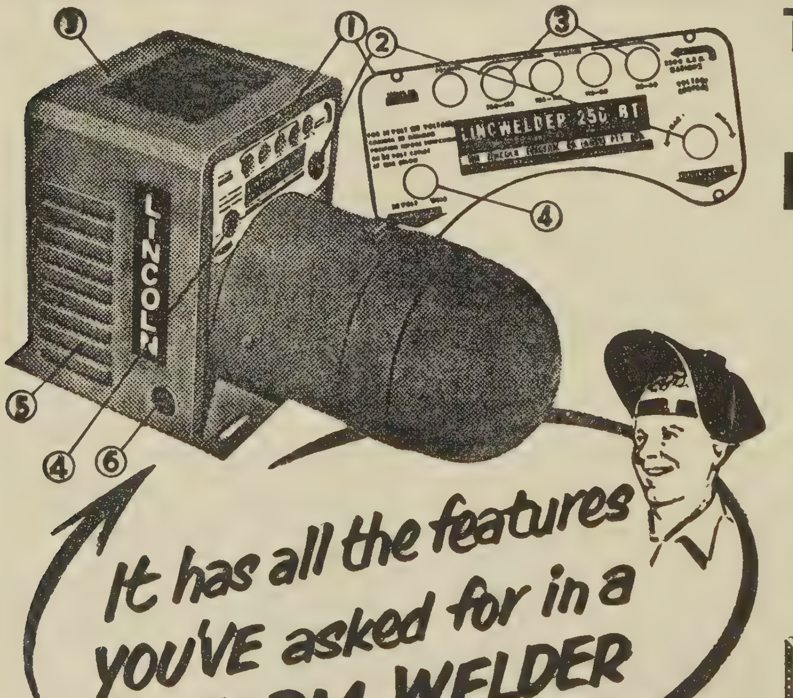
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the doors and opening windows are sent without hinges and must be fitted in situ.

It is always advisable to order joinery hung, as hanging after glazing is a hazardous undertaking which may result in broken windowpanes.

Joinery is supplied glazed, and if special types of glass are required, they must be stated when the order is placed.

If special types and sizes of doors or windows are required, the manufacturer needs to know the sizes of openings, and the height should always be given first; for example, a cupboard door which may be 3ft. wide and 2ft. high would be ordered as a 2ft. by 3ft. door.

Orders for outside doors must state if the frame is to be provided with or without a step, as doorsteps are sometimes eliminated to enable floors to be flush to the opening.

Architraves, skirtings, and sill boards are not provided with the joinery, but are included in the internal finish.

INTERNAL FINISH

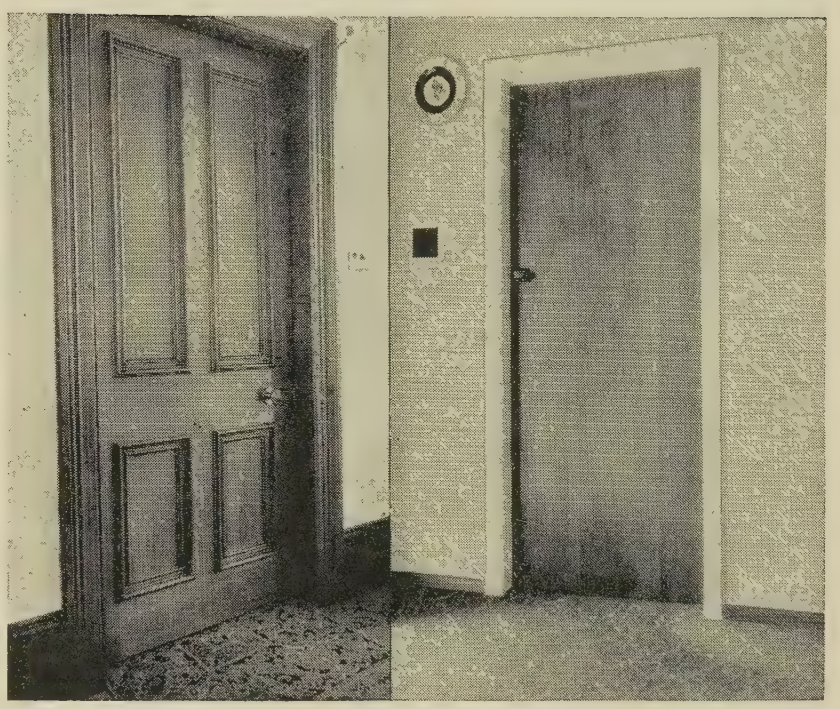
When a building has been framed, roofed, and sheathed and the external joinery (doors and windows) has been fitted it is completely protected from the elements. Before the building can be used something more than weather protection may be required.

Treatment of walls and ceilings and provision of internal joinery and facilities such as cupboards constitute what is known as finish.

A fertiliser or grain store does not require either heat insulation or a high degree of cleanliness and therefore will not require lining or covering of the floor, which may be either rough-floated concrete or timber. On the other hand a honey house requires both insulation and a high degree of cleanliness, so for this type of building internal lining and a smooth-floated concrete or close-boarded timber floor is essential.

The importance of factors governing finish must be decided by the use for which the building is being constructed. These factors are utility, convenience, cleanliness, insulation, ventilation, draught-proofing, comfort, and appearance.

The use to which the building or its compartments are being put decides the order of importance of those factors.



A contrast in finishing methods. Left—Panelled door, heavily moulded architrave, and high and heavily moulded skirting which were widely used 40 years ago. Right—Modern flush door with plain architraves and skirting.

Finishing Materials and Methods

Finishing materials for a building or its compartments should be chosen in relation to the use to which the space is being put and also in relation to the degree of importance of the factors listed above. For example, a kitchen, which is subject to a steamy atmosphere, fat vapours, and cooking odours, requires a lining material and finish giving a smooth, hard surface which can easily be washed down; it also needs good ventilation without draught. On the other hand a sitting room can be lined and finished with materials which require dusting only to keep them clean and needs no more ventilation than can be normally provided by window openings. A laundry, which is subject to steam but not odours, should be lined and finished as a kitchen, but normal ventilation through window openings would suffice.

The "New Zealand Standard Code of Building By-laws" recommends that all rooms should be provided with windows giving a total area of window space not less than a tenth of the floor area of the room, and that not less than half that area should be "so constructed as to open for the admission of air".

This means that a room, say, 100ft. square should be provided with a total window area of 10 sq. ft., 5 sq. ft. of which should open for ventilation. One window 4ft. 6in. by 2ft. 3in. with an area of just over 10 sq. ft. would suffice for light, and the opening half, 2ft. 3in. by 2ft. 3in., would provide sufficient ventilation for, say, a bedroom of this size, but these areas would be found inadequate for a 10ft. square kitchen, which, being a workroom, requires both good light and ventilation.

Both light and ventilation can be provided by modern louvre-type

TABLE I—STOCK SIZES OF DOORS AND WINDOWS

Outside doors	Height	Width	Type	Required openings
Front door ..	6ft. 6in.	2ft. 10in.	4 light	Door height + 3in. over joists
Back door ..	6ft. 6in.	2ft. 8in.	Either frame ledge or frame ledge open top*	
Laundry door	6ft. 6in.	2ft. 6in.		Door width + 2½in.
Inside doors				
	6ft. 6in.	2ft. 8in.		Door height + 1½in. over flooring
	6ft. 6in.	2ft. 6in.		
	6ft. 6in.	2ft. 4in.	Wardrobes or cupboards	Door width + 2½in.
	6ft. 6in.	2ft. 2in.		
	6ft. 6in.	2ft. 0in.		
Windows				
	4ft. 6in.	2ft. 0in.	1, 2, 3, 4, or 5 light	Window height + 4½in. Window width + 3in. for 1 light, + 1¾in. for each additional light
	3ft. 1½in.	2ft. 0in.		
	4ft. 0in.	2ft. 0in.		
	2ft. 0in.	3ft. 0in.		

* A frame ledge door has the frame of the door itself filled with tongue and groove planking. A frame ledge open top door has a glass top panel.

Window widths can also be 1ft. 10in., but are always in a full inch measurement to suit the glass, which is not cut to fractions of an inch.

TABLE 2—WALL LINING MATERIALS

Class	Type	Suitable applications	Suitable finishes	Methods of joining	How available
Timber fibreboard	Softboard	Lining of all rooms except bathroom, kitchen, laundry	Paint, distemper	Mouldings, beading, tooled edges	Sheets, various mouldings, decorative tiles
	Medium-board	Any lining	Paint, enamel, distemper, paper	Battens, beading	Sheets only
	Hardboard	Lining of any room paint finished. Suitable for bathroom, kitchen, laundry	Paint, enamel, paper	Battens, beading	Sheets, sheets tooled to tile pattern either plain or fine lacquered
Plaster-board	Fibrous plaster	Any lining	Paint, enamel, distemper, paper	Stopping	Sheets and mouldings
	Paper-covered board	Any lining	Paint, enamel, distemper, paper	Stopping	Sheets only
Lath and plaster	Lime-cement plaster	Any lining	Paint, enamel, distemper, paper	Continuous application	Materials worked on site
	Gypsum plaster	Any lining	Paint, enamel, distemper, paper		
Wood panelling	Plain or ply panels	Any lining	Oil, varnish, paint	Battens, beading, butted	Sheets: Ordinary bonded for normal work, resin bonded for damp situations; striated panels
	Metal-faced ply	Laundry, kitchen, bathroom	Paint or enamel	Metal strips	Sheets: Galvanised steel, aluminium, tinned steel, or copper. Metal on one or both sides
Plastic-coated laminates	Paper laminates	Any lining, table and bench tops	No finish required	Metal-covered beading or metal mouldings	Sheets only. Plastic on one side only
	Wood laminates	Any lining, table and bench tops	No finish required	Metal-covered beading or metal mouldings	Sheets only. Plastic on one or both sides
Vitreous sheet	One type only	Lining of wet places, table and bench tops	No finish required	Joined by butting or with beading	Sheets only
Plastic wood laminate panels	Double walled structural panel	Partition walls, giving plastic finish both sides	None required	Joined with H section beading or with timber spacers and metal cover moulding	Sheets only, 8ft. x 4ft. 1in. or 1⅝in. thick

windows, the whole area of which can be opened for ventilation. For windy situations where window openings may cause draughts kitchen ventilation can be obtained by the use of an exhaust fan placed so that cooking odours are not permitted to spread, but are caught at the source and dissipated outside the building.

The choice of lining materials for a building should be made not only in relation to the use to which the building is being put, but in relation to the covering which will be applied to them. For example, though some materials have good insulation properties, they are not as suitable for papering over as for painting.

Linings may be classified as shown in Table 2.

Where steam or moisture is present linings should be finished with a non-absorbent surface. Hardboard, plaster-board, or wood panelling should be finished with a good-quality high-gloss enamel, as a glossy surface remains clean longer than a satin or matt surface. Softboard is not suitable for the application of a high-gloss enamel covering, as its texture nullifies the advantages of the gloss.

Any lining can be papered or painted provided the surface of plaster or plaster-board is sealed to "fix" any alkali which may affect the finish.

Paper may be painted over to give a washable finish to a previously unwashable wall.

The processes of finishing or decorating using paint, enamel, paper, or distemper require a knowledge of trade techniques to produce satisfactory results. All these processes are within the capabilities of most amateur builders, but to ensure success a sound knowledge of technique must be obtained before any work of this type is undertaken. Practice will soon produce good results, and amateurs are well advised to practise on a section of wall where poor results will not be noticed.

Lining materials for ceilings may differ from those used for walls. For example, walls may be papered and ceilings may be finished white with distemper. Paper-covered plaster-board would be suitable material for the walls and fibrous plaster sheets for the ceilings.

Fibrous plaster is very suitable for ceilings. It is relatively soft and so is fairly easily damaged, but used for ceilings it is less liable to damage than on walls.

Architraves, Mouldings, Skirtings

Architraves, mouldings, and skirtings round off corners and frame openings and provide a finish between walls, floor, and ceiling and must be aesthetically satisfying.

A suitable moulding between ceiling and walls can give the effect of greater height, and moulded wall angles not only assist cleaning but also produce the impression of spaciousness.

Skirting boards protect the base of walls from damage by knocks. They should be of a shape and dimensions not only to prevent the collection of dust but to blend with mouldings and architraves.

Architraves round window and door openings provide that finish and appearance which together with colour, mouldings, and skirtings form the complete picture that must be in harmony and satisfying to the eye.

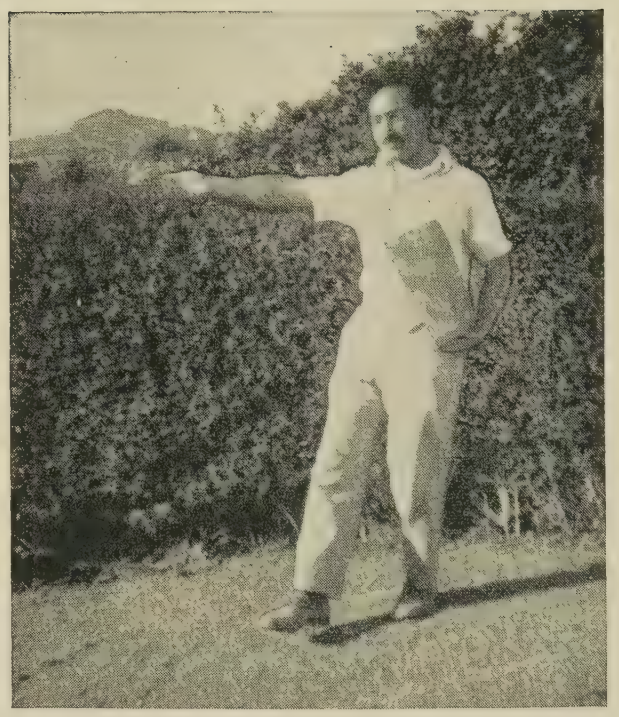
The illustration on page 183 shows a contrast in finishing methods. The panelled door, heavily moulded architrave, and high and heavily moulded skirting were in vogue 40 years ago. The modern flush door and plain architraves and skirtings are much more functional, having no dust pockets and embodying simplicity which lends itself to ease of manufacture, and are much more pleasing to the eye than the earlier complicated moulding.

Lining and colouring of walls and ceilings, the fitting of architraves, mouldings, and skirtings, and arrangement of cupboards and all the small items that make up internal joinery are a question of taste and should be chosen and arranged with a view to being pleasing to the people who must live with them from day to day.

Lighter Rates of Seeding for Playing Areas and Lawns Likely to be Satisfactory

By C. WALKER,
Assistant Fields Superintendent, Department of Agriculture,
Palmerston North

IN the past it has been accepted fairly generally that seed for the establishment of summer playing areas and home lawns should consist of 2 parts of chewings fescue and 1 part of browntop sown as a mixture at 1oz. per square yard. At this rate a dense coverage is provided, and such density was particularly desirable before the advent of modern weedicides to combat seedling weeds and clovers. Today, with the aid of weedicides and adequate manuring, the position is quite different, and it seems possible that lighter sowings, nursed by manuring and suitable spraying, could provide adequate ground cover at less expense.



TO test this theory two areas were sown during the past year, one in spring and the other in autumn. In each instance seeding rates were 1/5oz., 2/5oz., 3/5oz., 4/5oz., and 1oz. per square yard, spraying for weed control was practised, and the standard 3 : 1 sulphate of ammonia and superphosphate fertiliser dressing was applied at 1oz. per square yard quarterly.

Spring Sowing

From the spring sowing establishment was good and in the early stages was proportionate to the quantity of seed sown. Since then, with manuring and spraying, the areas sown with lighter rates have improved considerably in ground coverage, but the leafage is somewhat coarser than that on heavier-seeded areas.

From present indications ½oz. would appear to be sufficient for home lawns and ¾oz. for sports areas such as tennis courts, golf greens, and bowling greens.

Autumn Sowing

So far in the autumn-sowing trial the general pattern of results is very similar to that of the spring sowings. Again the concentration of fine-turf species has been more or less proportionate to rates of sowing, but to date insufficient time has elapsed to provide an opportunity for the lighter sowings to show the same improvement as did those sown in spring.

An interesting development is that there is far more *Poa annua* showing in autumn sowings than in those sown in spring, and this *Poa annua* establishment is greatest in the lightest sowings. The reason for such heavy infestation in autumn sowings appears to be that summer seeding of this species had taken place before sowing. With spring sowing the prior cultivation would destroy *Poa annua* seedlings and there would be little seed in the soil from which it could re-establish.

These trials show that lawns can be established successfully from spring sowings, provided preparation of the seed-bed is good and watering is adequate over dry periods. Added to this it does seem that *Poa annua* invasion—a problem in lawn establishment generally—is much less in spring-sown than in autumn-sown areas.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during May 1957 and for the 10 months ended 31 May 1957 with comparative figures for the same month and 10 months of 1955-56 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc. or dec.
May 1957	3,723	150	3,873	—
May 1956	3,817	157	3,974	—
Increase or decrease	—94	—7	—101	—2.541
10 months ended 31/5/57	151,657	2,893	154,550	—
10 months ended 31/5/56	159,355	2,936	162,291	—
Increase or decrease	—7,698	—43	—7,741	—4.770

Butter in store at 31 May 1957 was 25,406 tons

Note: In the 3 months January-March 3,990 tons of ice cream base were graded for export at Auckland, but not included in the butterfat figures.

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.
May 1957	4,684	376	5,060	—
May 1956	5,451	—	5,451	—
Increase or decrease	—767	+376	—391	—7.173
10 months ended 31/5/57	78,839	10,354	89,193	—
10 months ended 31/5/56	77,918	12,702	90,620	—
Increase or decrease	+921	—2,348	—1,427	—1.575

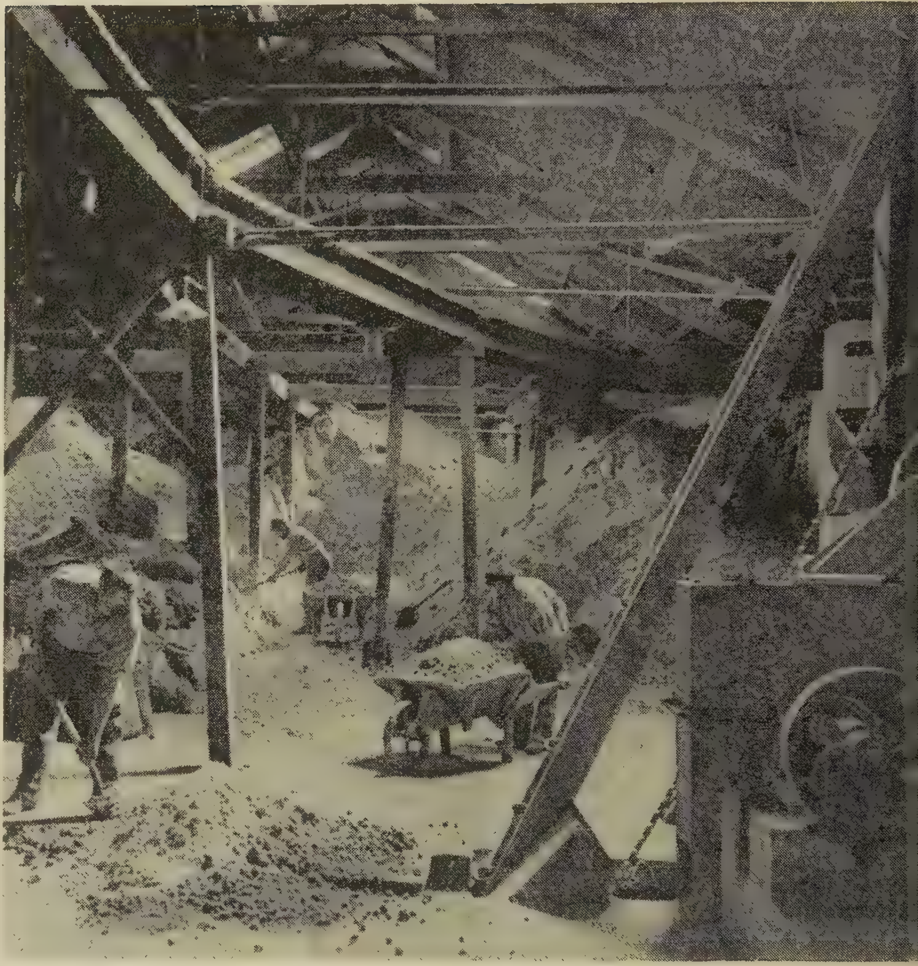
Cheese in store at 31 May 1957 was 22,008 tons

If these figures are converted into butterfat equivalent, there is a decrease of 4.127 per cent. in butterfat graded for the 10 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

The Growth of Fertiliser

By A. N. TAIT,
Department of Agriculture, Wellington

NEW ZEALAND farmers have, with the assistance of agricultural scientists, evolved a unique system of management and use of pasture in which fertilisers, especially phosphates, have a part which is important now and which will become progressively more important. Almost all easily accessible dairy and sheep land in New Zealand has been topdressed regularly for more than 30 years. The present trend is to use fertilisers in maintaining production in those areas, but also to apply it in one of the several steps necessary for the development of second- and third-class land and land which in the past has been regarded as problem country.



An old photograph of the Westfield superphosphate works, probably early this century. The wheelbarrow and shovel still figure prominently, but machinery is beginning to take a place in the manufacturing process.

BECAUSE most soils in New Zealand are deficient in phosphates, phosphatic manures, chiefly superphosphate, have always been the most widely used fertilisers. About 1,100,000 tons per year, of which some 1,000,000 tons are represented by superphosphate and its derivatives, are used.

Superphosphate is made locally from Nauru and Ocean Island rock phosphate and American sulphur. From 70,000 to 100,000 tons per annum of other phosphates, mainly basic slag, soft rock phosphate for direct application, and concentrated superphosphate are also imported.

The next most important group of fertilisers in tonnage are the potashes, mainly muriate and sulphate, imports of which are averaging about 35,000 tons a year. About 15,000 tons per year of various types of nitrogenous manures are imported, and local sources contribute 35,000 tons a year of organic manures such as blood and bone, which contain both phosphate and nitrogen.

In contrast to practices in many other countries approximately three-quarters of New Zealand fertiliser sales are of straight superphosphate or superphosphate reverted with crushed serpentine rock or limestone. Fertiliser mixtures in total are not relatively important. In the main they comprise superphosphate with which has been mixed trace amounts of boron, cobalt, copper, magnesium, and molybdenum or mixtures of superphosphate and muriate of potash. Special-purpose mixtures are compounded for crops, market and home gardening, and orchardists.

The local superphosphate industry thus holds a dominant position in the supply of fertiliser which most vitally affects farming in New Zealand. There are now 9 superphosphate works and 3 more are under construction. The manufacturing industry has met the increasing demands for superphosphate very well, except when there were interruptions in the supply of raw materials or of materials to expand existing works or to build new ones. In these instances, however, circumstances were beyond the control of the superphosphate manufacturers.

Surveys by the Department of Agriculture indicate that ultimately New Zealand will require twice the present available tonnage of superphosphate. Much of the increase is expected to be required for areas that have been brought within reach of topdressing through the introduction of aerial application.

The farming industry is becoming directly interested in the building of works. The newest operating, that near Napier, is owned by several thousand farmers, and two of the three now under construction are being built by farmers' co-operative companies with assistance from producers' pool funds.

Most of the older works have recently completed or are still working on expansion programmes. The correct placing of new works to provide a network to cover the whole country with maximum economy in distribution is now being given much emphasis.

Pioneer Farmers

At about the time colonisation in New Zealand began Leibig in Germany and Lawes in England were working independently on the chemistry of soils. Before this the only manures used were animal excreta, crushed bones, seaweeds, and any other natural organic materials which were easily obtained.

Use in New Zealand

[Sparrow

In superphosphate works today all the bulk fertiliser is moved and turned with large grabs, bulldozers, and conveyer belts.

In 1840 Leibig published his finding that the phosphate contained in bones became available more quickly in the soil if they were previously treated with sulphuric acid. In 1842 Lawes went a step further by patenting a process he had evolved for the manufacture of superphosphate from a mixture of phosphatic guano and phosphatic rock. In 1843 he started commercial manufacture.

About this time also Peruvian guano came to be used widely in European agriculture, and for about 30 to 40 years it was the main commercial fertiliser. During that time about 12,000,000 tons were taken from Peru and by 1875 supplies were almost exhausted. However, in its place superphosphate was coming into prominence.

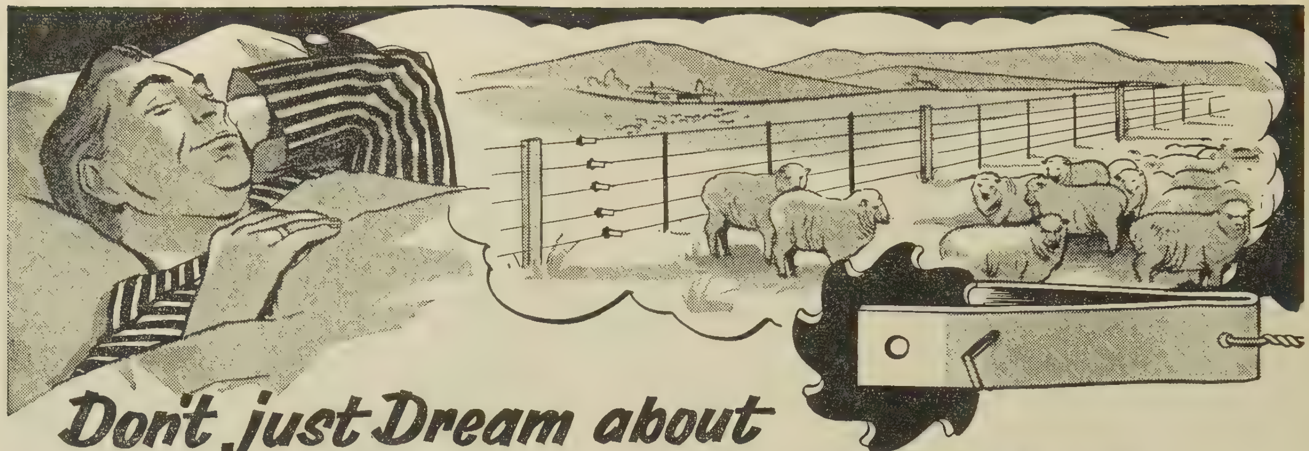
Pioneer farmers brought with them to New Zealand not only experience of traditional British farming but some of the new concepts of crop feeding which were taking hold slowly, though about which there was still much scepticism in Europe.

However, in New Zealand the pioneer farmer faced an entirely new set of conditions. His first task was to break in and develop virgin land, and all his available labour and capital were fully engaged on this. The milder climate made stall feeding, with its resultant accumulation of natural manures, unnecessary. The first crops flourished in the virgin soil and the main concern was not the maintenance of fertility, but the quickest method of exploiting the natural fertility.

Old records and statistics show that as more and more land was developed progressive farmers soon became conscious that most New Zealand soils needed fertilisers, especially phosphates. With the flair for improvisation typical of pioneer New Zealand farmers, they turned first to the materials closest to hand.

Production and Imports 1867-80

Before the introduction of refrigeration on ships in New Zealand in 1882 enabled frozen meat to be exported many of the surplus carcasses were boiled down to recover the tallow.



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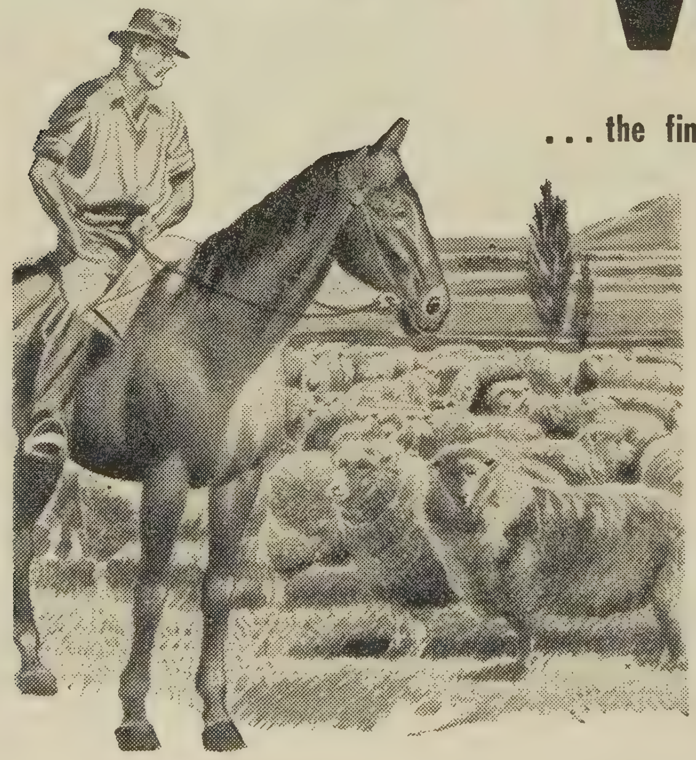

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Vacmark is fully approved. All colours of Vacmark are approved by the New Zealand Department of Agriculture as wool marking preparations for the purposes of the Stock Act, 1908.

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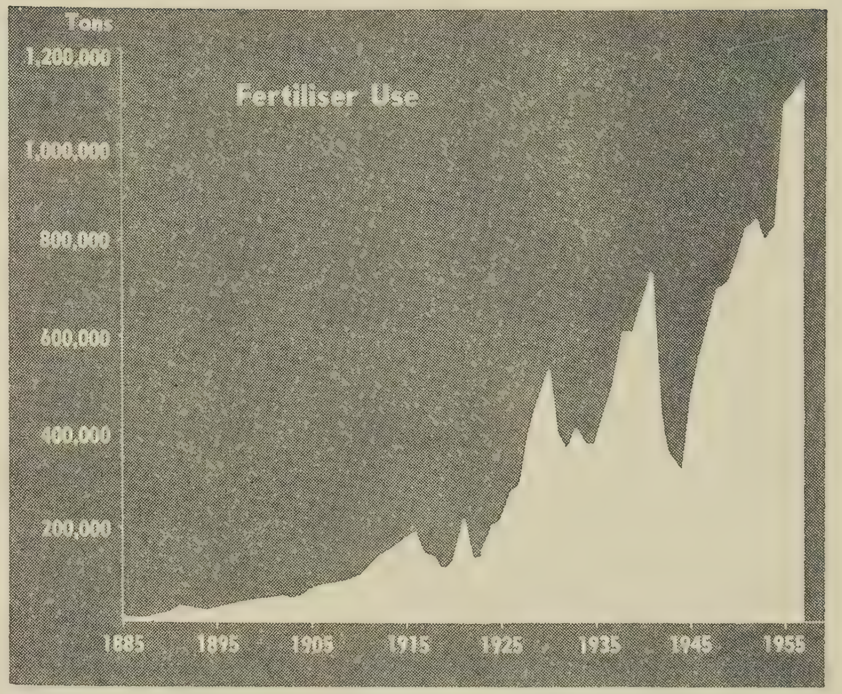
GROWTH OF FERTILISER USE



The tonnage of all types of artificial fertilisers used increased from about 10,000 tons a year in 1885 to 1,136,000 tons by 1956, an average annual increase of some 15,000 tons. Coupled with this and with land development generally the total livestock carrying capacity has risen steadily from 2,750,000 to 10,000,000 milking cow equivalents.

Canterbury farmers particularly were quick to improvise methods by which the resultant crushed or otherwise-treated organic remains could be used in crop manuring. One procedure described in a journal of the period was to heap up bones and lime, saturate them with urine, and cover them with earth; next year the material was ready for use. Another article described a circular concrete trough with a heavy, horse-drawn, concrete wheel moving round to crush the bones.

The first record of fertiliser imports into New Zealand is for 1867, when 459 tons of Pacific island guano were imported. Varying amounts up to 1700 tons of phosphatic guanos and natural rock phosphates are shown in old statistics (under the heading of "Guanos") as coming in each year from 1867 to 1880. The only shipment of guano to come from Peru to New Zealand was in 1875.

Up to 1880 about 9500 tons of guanos had been imported. This was augmented after 1880 by substantial imports of bonedust and "Unenumerated" manures. The latter probably consisted largely of superphosphate, a small quantity of which was first imported in 1880 by W. E. Ivey, the first Director of Canterbury Agricultural College, and used at Lincoln to demonstrate its value on New Zealand soils.

Production and Imports after 1880

In 1878 a meat-preserving works at Timaru began producing steamed bonedust. This is the first record of fertilisers being produced on a commercial scale in New Zealand. With the establishment of meat-freezing works after 1881 production of organic fertilisers increased rapidly. Demand increased even more rapidly, and large imports of bonedust were made from 1880 onward from Australia and later from India, reaching their peak in 1902, when 14,000 tons were imported.

Considerable quantities of guano, which by this time were being worked in various islands in the Pacific, were also being imported. Detailed records of other imports are not available, but superphosphate appears to have come in from England in larger quantities after about 1882 and potash to have been imported initially (from Germany) in 1888. Basic slag was first used in New Zealand in 1891, and about this time Japan and Australia, where the superphosphate manufacturing industry was well established, were also supplying superphosphate.

The first detailed records (for 1909) show that over half the fertiliser imports, apart from rock phosphate, were of superphosphate (21,910 tons).

Superphosphate Works Established

A small commercial sulphuric acid plant at Burnside, near Dunedin, established in 1881 by Thomas Whitelock Kempthorne, founder of the well-known chemical firm of Kempthorne Prosser and Company's New Zealand Drug Company Ltd., was extended in 1882 to manufacture superphosphate. In sharp contrast to the modern works, where plant and machinery costing £1,000,000 or more is employed and all bulk fertiliser is moved and turned by large grabs, bulldozers, and conveyer belts, the first method of manufacture was exceedingly simple, wheelbarrows and shovels figuring prominently in the manufacturing process. With the increase in demand the Dunedin works was enlarged several times and was rebuilt in 1929.

The success of the Burnside venture induced Kempthorne Prosser to build another superphosphate works at Westfield, near Auckland, in 1887. This works served the Auckland Province for many years before it was destroyed by fire. It was soon rebuilt on more modern lines.

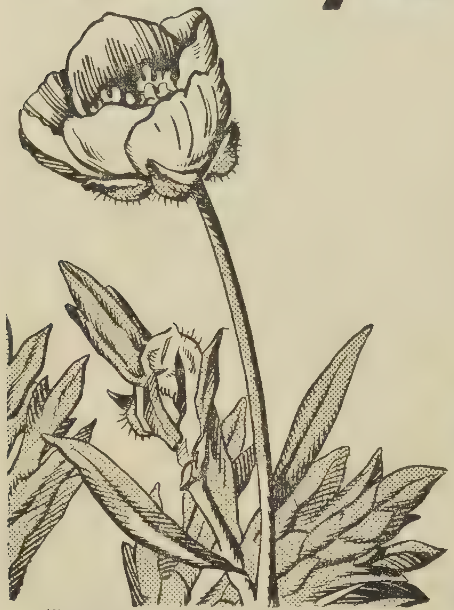
The decade 1878 to 1888 thus saw the establishment of the commercial fertiliser industry in this country, with several freezing works producing blood and bone manures and two superphosphate works operating. There is no record of the production of these two superphosphate works in their early years, but it is known that some of the superphosphate was made from bonedust and some from low-grade phosphatic guanos and phosphate rock from Pacific islands. However, as dairying developed in the Waikato in the 1880s and 1890s the demand for superphosphate in the north grew. In the South Island production also increased considerably as use of superphosphate for crops became more general.

Estimate of Fertiliser Use 1870-1900

The figures available show that the use of fertilisers increased rapidly between 1870 and 1900. In 1870 imports were about 1000 tons, but by the 1880s about 8000 tons a year, including manures from local freezing works, was being used. During most years of the 1890s the quantity used remained fairly constant at about 20,000 tons until the passing of the world-wide economic depression of this period. In 1897, 1898, and 1899 there was a rapid increase in use, due partly to the encouraging results being obtained by the more progressive farmers, who were pioneering the practice of pasture topdressing.

In 1900 28,817 tons of manures were imported, comprising 6779 tons of bonedust, 9935 tons of guano, and 12,103 tons of "Other Manures", which are not classified in the records. These imports would include any raw phosphates used in superphosphate manufacture and would consequently more or less cover local superphosphate manufacture. In addition, about 12,000 tons of organic manures were being produced by local meat-freezing and boiling-down works. In the last 30 years of the 19th century fertiliser use

Were your pastures yellow with buttercup?



Illustrated: Creeping (Ranunculus repens)

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rose from less than 1000 tons per year to over 40,000 tons per year.

These quantities seem small in comparison with recent figures, but they provided the basis for soil maintenance and improvement on the pattern that has since become standard practice and it marked a new era in the fertiliser industry and in farming.

North and South Island Development

The pattern in fertiliser use during the first 60 years of colonisation differed a good deal in the North and South Islands. This was due largely to the nature of the land being developed and to the turn of events.

Though the first organised settlements were established in the North Island, development was faster in the South Island. On the Canterbury Plains particularly the natural cover was light, roads and railways were easily formed, and early subdivision of the large grazing runs led to a period of large-scale wheat farming and annual cropping. Otago, too, had developed the cropping system and settlement there progressed steadily, after a hesitant beginning.

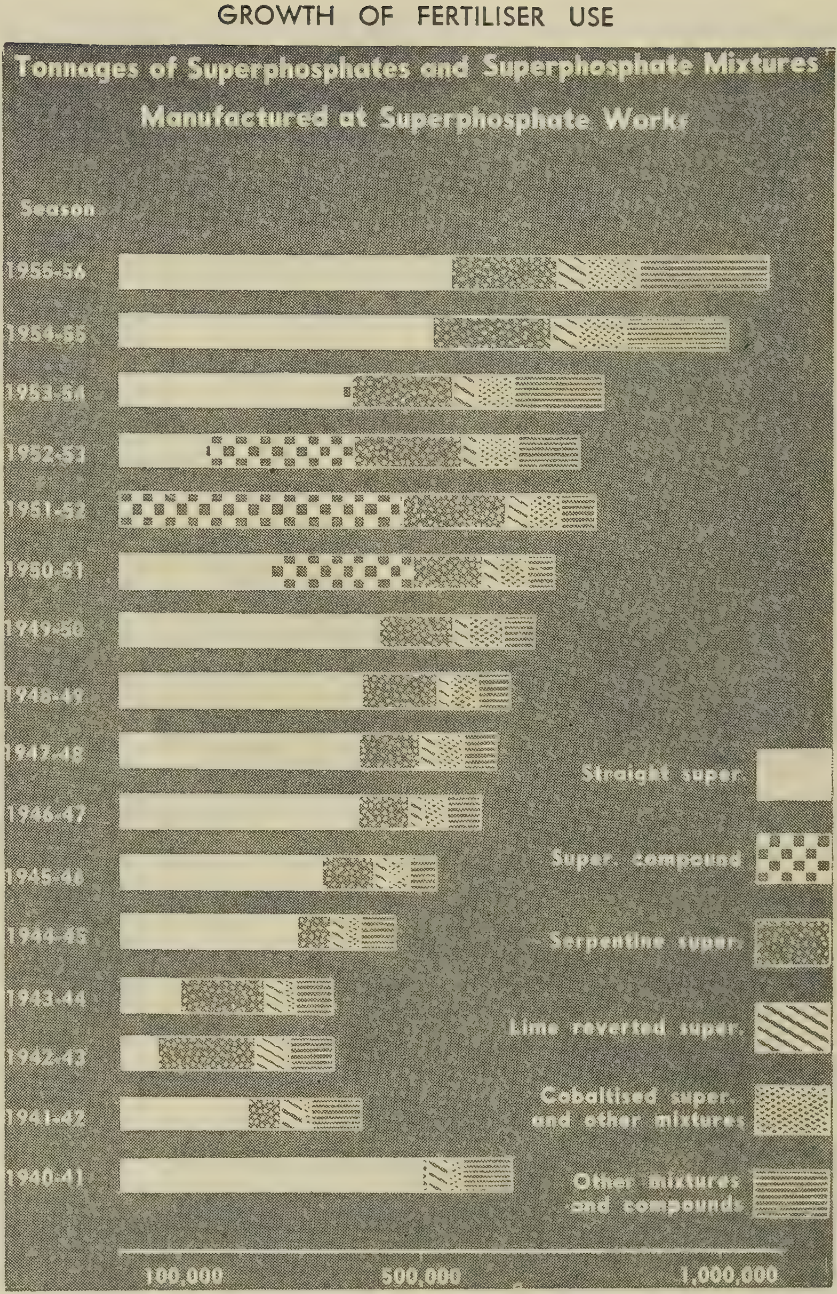
Canterbury and Otago development was given early impetus by the demand for food from the Otago and West Coast gold rushes of the 1860s, and farmers were able to establish themselves quickly. Though subsequent subdivision and other factors have since produced modifications, cropping is still an integral part of much South Island farming.

In the North Island, where at present about 75 per cent. of New Zealand's total tonnage of fertilisers is used (mainly on pasture), development was retarded by the Maori Wars, the problems of clearing bush-clad land, and difficult access. In some areas the settlers had been allocated small and sometimes uneconomic blocks. The influx of new settlers was smaller than in South Island centres and most of the developing farming areas were not close to profitable markets. Offsetting these difficulties was the fact that bush-burn sowings initially provided more than adequate feed for the limited number of stock available.

However, on the poorer soils of some extensive areas, notably in the Waikato, new concepts of manurial practice began to take shape, because they appeared to offer hope of development of livestock farming, to which the area seemed best suited.

When settlement in the Waikato began, after the Maori war ended there in 1864, it was soon found that the volcanic soils of the central and northern North Island could not maintain a good sole of English grasses. Much of the Waikato land could not be farmed successfully in the original, small military land grants and by 1875 many such holdings had been aggregated, and the owners attempted to develop a typical English rotational cropping system.

GROWTH OF FERTILISER USE



Production of superphosphate and main types of superphosphate mixtures and compounds since 1940-41. The effects of wartime shortages and of restriction on the sale of straight superphosphate because of a sulphur shortage in 1951, 1952, and 1953 are shown.

For a time large areas were sown to wheat and other cash crops, but these soon exhausted the soil. Grain prices were uncertain and often uneconomic. Most attempts to establish the traditional English system failed and the cropping phase soon passed.

After the introduction of refrigeration in the 1880s Waikato farmers turned to dairying on grassland. From that time North Island and South Island farming systems began to diverge.

As yet pasture topdressing on a large scale or as a regular practice was undreamt of, except perhaps by a few of the bolder pioneers in the Waikato, who toward the latter end of the century were beginning to sense the possibilities of applying fertilisers other than in the then conventional manner of a dressing for annual crops. It was noticed that fertilisers used for crops noticeably improved pastures sown subsequently and this led to the practice of using fertilisers when sowing down to grass.

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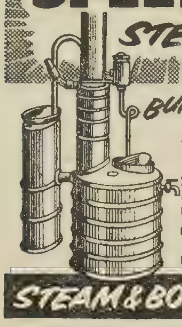

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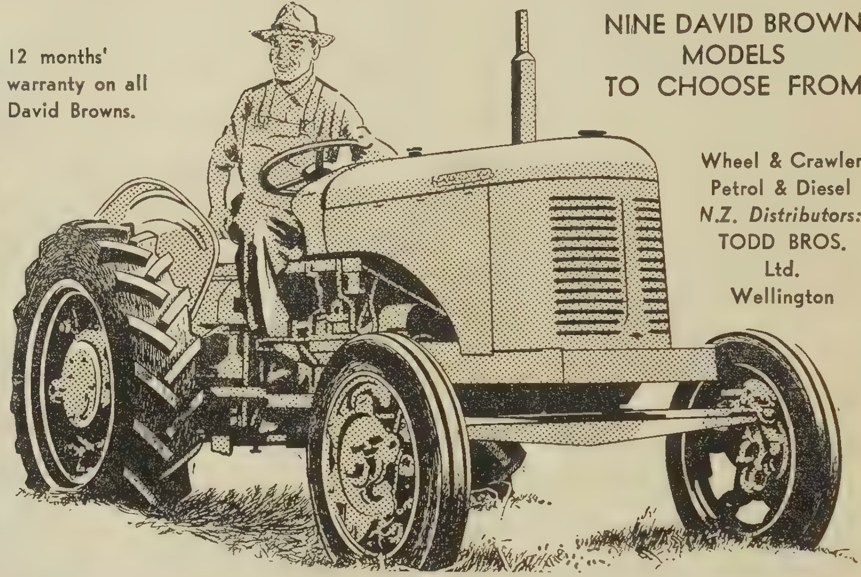

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To maintain the fertility of the poorer soils farmers on these soils were forced to explore the possibilities of topdressing of established pastures with artificial manures. Even so farmers who were bold enough to try it appear to have been derided by those who were fortunate enough to be on the better land.

However, the results of the use of fertilisers on pastures were convincing enough and saved many of the Waikato farmers during the lean times toward the end of the century. Later when prices became more stable and the overseas market for farm produce expanded farmers were anxious to increase production. All that was lacking was a lead on how best to accomplish their objective.

Factors Stimulating Use after 1900

In 1899 the Department of Agriculture appointed its first soil chemist, Bernard Cracroft Aston, a pioneer in fertiliser research and for many years an ardent advocate of the use of fertilisers. In 1904 at the request of farmers' organisations in the Auckland district pasture topdressing trials were begun by the Department of Agriculture at Ruakura and other experimental farms in the area. Reports on these trials published in the annual reports of the Department of Agriculture from 1905 to 1909 caused widespread interest not only in the Waikato, but in Taranaki and other dairying districts by stressing the fact of "phosphoric acid being the dominant manurial ingredient required in most soils in this Dominion".

Initial responses on run-out pastures at Ruakura reported in 1905 were in marked contrast to untreated portions and "now other grasses and white clover are appearing. . . . This would lead up to the idea that, in place of the usual routine here—roots, grains, grass, or vice versa, then after a few years in grass, the process repeated—the grass should be laid down, with the land in the best condition, and having sown this grass conserve it with judicious topdressing". This, in fact, forms the basis of present grassland farming in New Zealand.

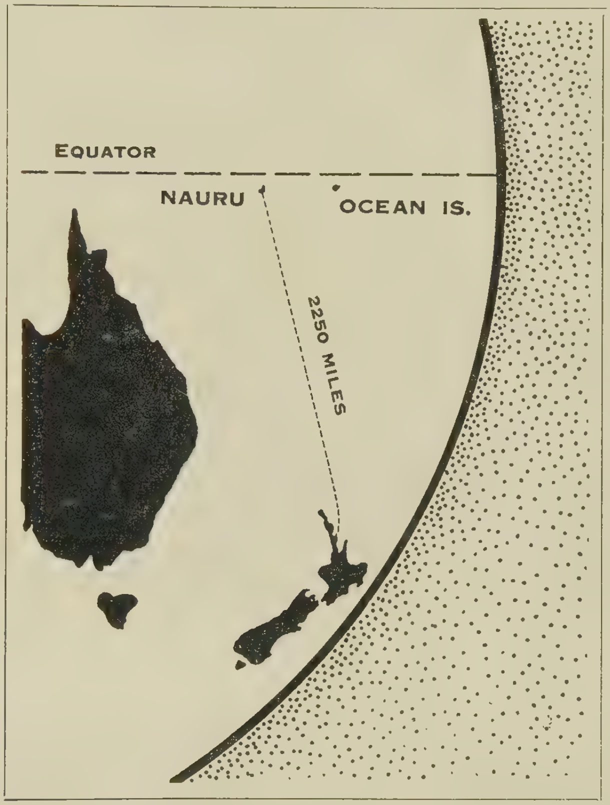
Rock Phosphate Discoveries

A development which opened the way for the expansion of the superphosphate industry in this country was the discovery of rich deposits of high-grade rock phosphate on Ocean Island and Nauru, some 2000 miles north of New Zealand, just before the turn of the century. An interesting account of the development of the phosphate deposits on these two islands is given in the book "Ocean Island and Nauru" by the late Sir Albert F. Ellis, who was closely connected with the discovery and working of the rock phosphate deposits for over 50 years, both with the Pacific Phosphate Company and later as the first New Zealand Commissioner on the British Phosphate Commission.

In 1902 deposits of a lower-grade phosphate, containing about 60 per cent. tricalcium phosphate, were discovered at Clarendon, Otago. The Clarendon deposits, however, proved of little significance, as they could not compete either in quality or in price with the richer, Nauru and Ocean Island rock. Nevertheless they were worked on a small scale, producing up to 10,000 tons per year until 1926. Most of this output went to the superphosphate works at Burnside.

British Phosphate Commission

Rock from Ocean Island was first imported in 1900. Imports increased steadily, being supplemented by supplies from the German possession of Nauru after 1906. Not until after the First World War were deposits exploited to the best advantage, when the Pacific Phosphate Company's plant and concessions on Nauru and Ocean Island were bought and taken over jointly in 1920 by the Governments of Great Britain, Australia, and New Zealand.



The British Phosphate Commissioners, representing the three Governments, have since 1920 greatly improved loading facilities at the two islands and have been singularly successful in supplying the raw rock phosphate to the superphosphate industry in Australia and New Zealand at a very low, standardised price covering cost of production, shipping, and sinking fund on the capital invested. They have also acted as buying and shipping agents for the sulphur and nitrate of soda used in superphosphate manufacture.

1900-16: Fourfold Increase in Use

The increase of local superphosphate production between 1900 and 1916 can be gauged from the steady increase of imports of rock phosphate from Nauru and Ocean Island and from the Clarendon production of rock. These figures indicate that superphosphate production had reached about 75,000 tons by 1916.

The production of organic fertilisers also increased steadily, and imports of manufactured fertilisers reached over 100,000 tons a year before supplies were curtailed by the war. These imports included as much as 14,000 tons of bonedust in a year, mainly from India and Australia, 30,000 tons of basic slag in 1914 from Belgium, Germany, and the United Kingdom, and up to 58,000 tons of superphosphate from Australia, Britain, Holland, and Japan. Small but increasing quantities of potassic and nitrogenous fertilisers were also included.

Largely as a result of strong advocacy by the Department of Agriculture, fertiliser use more than quadrupled in the 16 years, but during the latter part of the 1914-18 war supplies of basic slag from the Continent were entirely cut off and lack of shipping curtailed superphosphate and other fertiliser imports from elsewhere. The total fertiliser supply from all sources dropped from the record figure of 187,000 tons in 1916 to slightly over 100,000 tons in 1919. The available supplies were augmented to some extent by imports of "Ephos", a North African soft natural phosphate brought from the Red Sea by returning troopships. Imports of this type of fertiliser reached 15,000 tons in 1920, but supplies from this source soon dwindled after the war.

War Aids Local Production

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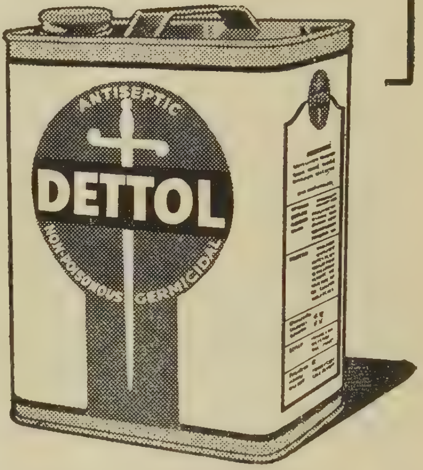

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phate, basic slag, and North African phosphate) were in short supply and had increased in price. Supplies of locally produced superphosphate were insufficient to meet the increasing demand. There was a widespread feeling among farmers that under competitive conditions the local product could be produced more cheaply and in greater quantity.

Six New Works

The confidence of farmers in the local industry led to the formation of the New Zealand Farmers' Fertiliser Company Ltd., a farmers' organisation, in 1917, but the company's first works at Te Papapa, near Auckland, was not completed until April 1921. In the same year Wright, Stephenson and Company Ltd. were erecting a large works at Otahuhu, also near Auckland. Their mixing plant was completed in 1921, but the manufacturing units were not finished until 1924 and 1925.

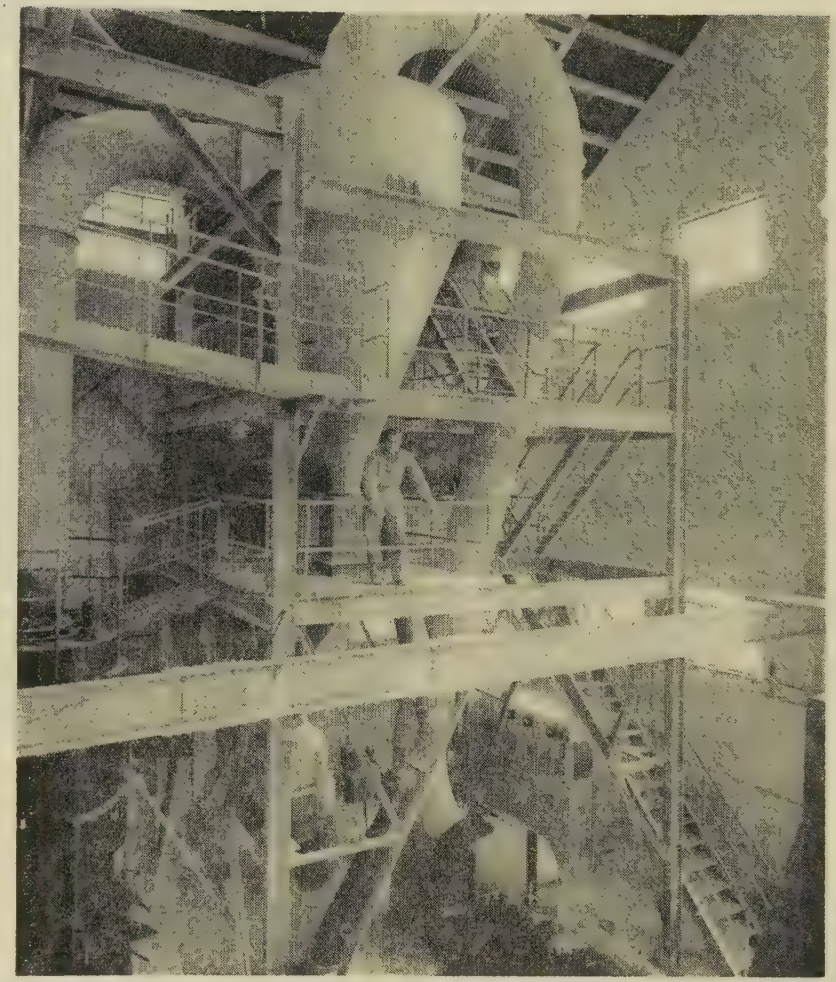
This works, which had in the meantime been formed into the Challenge Phosphate Company Ltd., was then able to produce about 90,000 tons of superphosphate per year. With greatly increased production capacity today it still remains the largest works in New Zealand.

With three works established near Auckland the province was assured of adequate fertiliser for many years. In other parts of New Zealand increasing demand led to the establishment of four new works in quick succession. The Hornby works, near Christchurch, and a works at Aramoho, near Wanganui, were established by Kempthorne Prosser in 1922 and 1925 respectively, and the New Zealand Farmers' Fertilizer Company Ltd. took over a freezing works near New Plymouth and converted it to superphosphate manufacture. Production began there early in 1926.

The Dominion Fertiliser Company Ltd., formed in 1929, built a works at Ravensbourne, near Dunedin. This works is the only one in New Zealand up to the present which has unloading for its raw materials—phosphate, sulphur, and nitrate of soda—direct from overseas vessels. One fused phosphate works at Huntly produced "Heskett" slag for about 10 years, but closed down in 1950.

Rapid Advance in Topdressing

The work of the Department of Agriculture in developing and teaching sound agricultural practices was now bearing fruit. Farmers throughout the country were becoming aware of the advantages of fertiliser use. The sowing of fertiliser with crops had become practically universal and the topdressing of pastures was becoming general, especially in the dairying and fat lamb areas. Government action in connection with Nauru and Ocean Island had assured New Zealand of adequate quantities of the basic raw material. Superphosphate manufacturing capacity was more than keeping up with the demand, and the publicity created by the keen competition between the rival manufacturers was a factor in increasing the interest of the farming community and hence raising the demand.



[*Sparrow*

Rock phosphate grinding mill at a modern works.

By the 1929-30 season the total quantity of fertiliser used was 526,000 tons, including about 300,000 tons of locally made superphosphate, 95,000 tons of imported basic slag, and 25,000 tons of blood and bone and other organic manures.

Bush Sickness and Cobalt

During the world-wide depression of the early 1930s fertiliser use was restricted because farmers could not afford to buy all they needed. However, about this time a discovery was made that is important in the history of the fertiliser industry and which immensely enhanced the productive capacity of parts of Auckland, Nelson, and Southland. It was found that cobalt deficiency was the cause of bush sickness. This was the name given to a wasting disease that was making livestock farming unprofitable in substantial areas, particularly in areas of pumice soils.

Experiments proved that the most effective means of supplying cobalt to cobalt-deficient soils was by topdressing with cobaltised superphosphate (superphosphate to which cobalt sulphate was added at the rate of only 5oz. per acre). Provided regular dressings were made, this was adequate to correct deficiencies and keep stock healthy. Today about 90,000 tons of cobaltised fertilisers are used. As other soil deficiencies have been proved it has become standard practice for fertiliser manufacturers to include small amounts of other elements in superphosphate. Copper, boron, magnesium, and more recently molybdenum are now incorporated. These mixtures, though in total a relatively small percentage of all the fertiliser used, are an important feature of fertiliser manufacture.

Fertilisers containing insecticides also have a small sale, mainly in the South Island.

In the year ended 30 June 1956 the following sales were made:—

Fertilisers containing	Tons
Boron	3,665
Cobalt	90,445
Copper	17,603
Molybdenum	38,032
Insecticides	8,221

Mixtures containing various percentages of potash are also in demand for soils showing signs of potash deficiency. Superphosphate works sell about 70,000 tons of such mixtures and many proprietary mixtures containing potash are also sold.

Recovery up to Second World War

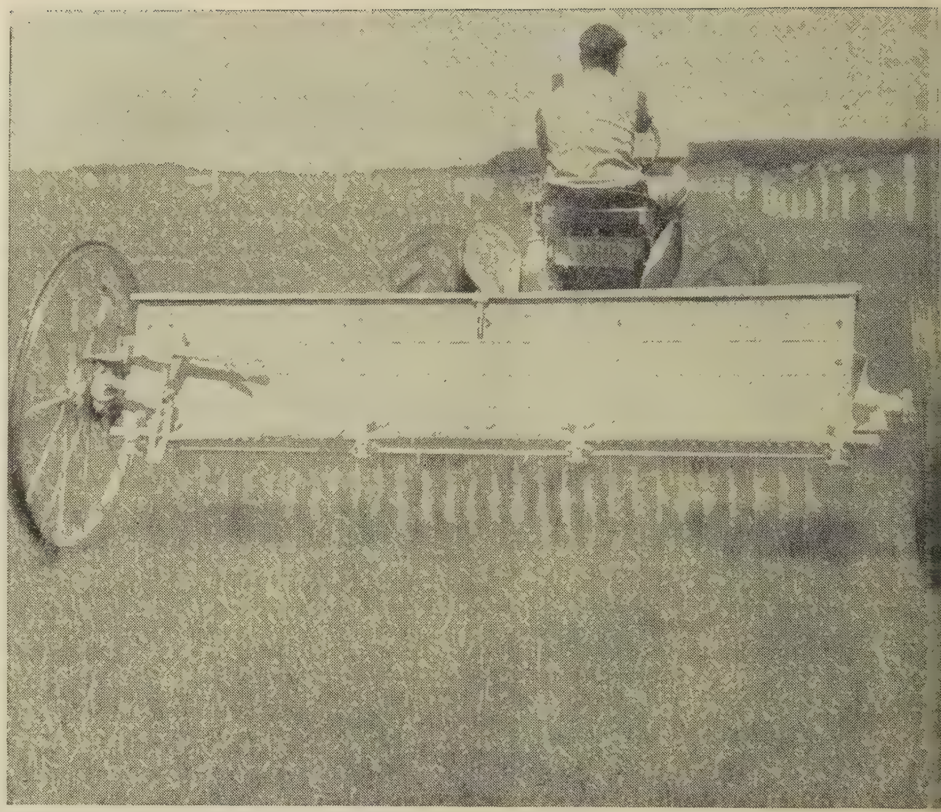
After the depression of the early 1930s fertiliser use again began to expand. From the 360,000 tons to which it had dropped in 1932 it reached 737,000 tons by the 1940-41 season. At that stage the Second World War had begun to affect the industry. Because of the dislocation of shipping after 1939 and the occupation of Nauru and Ocean Island by the Japanese in August 1942, new sources of phosphate rock had to be found. It was brought mainly from the French island of Makatea in the Pacific Ocean, from Kossier in North Africa, and later some from Florida, U.S.A. The deposits at Clarendon, Otago, were reopened for a short time and supplied small tonnages for South Island works.

However, supplies from all sources were insufficient to meet normal requirements and fertiliser rationing was introduced. The system was concerned primarily with the maintenance of dairy and vegetable production, and every effort was made to conserve and make the best possible use of the fertiliser available.

Serpentine Superphosphate

Another innovation in the industry about this time became most useful in helping out fertiliser supplies during the war and has since made a valuable contribution to manurial practice. This was commercial production of serpentine superphosphate, which was begun in July 1940.

The 1955-56 production of 289,300 tons gross of serpentine superphosphate reflects not the extent of the farmers' demand for this fertiliser as much as the present difficulty of obtaining sufficient available supplies of serpentine rock. Serpentine superphosphate contains 25 per cent. of serpentine rock, which is found in certain parts of New Zealand. It is a free-running, non-acid, citrate-soluble type of fertiliser which has found popularity over a wide range of conditions in New Zealand.



On flat and rolling dairy and sheep land regular topdressing has been an established practice for more than 30 years.

Post-war Shortages

The phosphate-loading installations on Nauru and Ocean Island were extensively damaged by the Japanese, and it was not until 1950 that these and other supply difficulties were fully overcome and the fertiliser industry in New Zealand regained its pre-war output. The stage then seemed set for rapid expansion, but difficulties in securing plant continued to retard development.

In 1950 also a world shortage of sulphur developed. The Sulphur Committee of the International Materials Conference was set up to allocate supplies, but at one stage New Zealand's quota of sulphur for sulphuric acid in the manufacture of superphosphate represented only about two-thirds of its requirements. At this time the development of aerial topdressing was creating fresh demands for fertilisers for hill country. As farmers were anxious to avoid a return to the rationing system which operated during the war, the alternative was adopted of prohibiting the sale of straight superphosphate and bulking up superphosphate at the works with untreated rock phosphate, serpentine rock, and lime. This had the effect of increasing the total supply of fertiliser from a reduced supply of sulphuric acid.

The difficulties caused by shortages of materials have now been largely overcome. Local production of superphosphate and superphosphate mixtures reached 1,000,000 tons for the first time in the 1954-55 season.

The discovery of extensive new deposits of sulphur in Mexico and the United States and the development of new sources elsewhere have extended the probable availability of Frasch-process sulphur beyond 1960—earlier predicted as the limit of visible resources. Alternative methods of acid manufacture overseas have also relieved pressure on world sulphur supplies, restrictions have been lifted, and New Zealand's sulphur requirements seem to be assured for many years.

Aerial Topdressing Expands Rapidly

It is singularly fortunate that the aerial topdressing industry, which has developed rapidly over the past 7 years, has not been unduly handicapped from lack of supplies, as this method of application, which now

[*National Publicity*

In 1956 an eighth of the total grassland in New Zealand was topdressed by air. Much hill country had not been topdressed until aerial application was developed about 7 years ago.

absorbs more than one-third of the available fertiliser, is already considerably increasing pastoral production on much of the second-class hill land.

The following table shows the rapid expansion in this new industry:—

AERIAL TOPDRESSING

Year (ended 31 March)	Hours flown	No. of flights	Weight distributed (tons)	Area treated (acres)
1950	2,137	32,055	5,003	48,741
1951	16,080	241,200	44,957	428,737
1952	27,992	448,710	88,869	802,212
1953	40,727	649,908	144,802	1,376,118
1954	54,038	832,181	203,110	1,929,499
1955	70,789	1,079,269	279,006	2,783,802
1956	79,747	1,155,310	404,933	3,853,169

Still more second-class hill country can be profitably topdressed. Aircraft specially designed for topdressing, with a loading capacity of $\frac{3}{4}$ ton to 1 ton, are now replacing the smaller Tiger Moths which pioneered and established the industry.

Planning for the Future

To meet expected demand several of the existing works are being enlarged. The manufacturing capacity of the new Napier works has been substantially increased and Kempthorne Prosser are extending their Canterbury works. Further expansion of the other existing works can also be expected.

A farmer-owned works at Tauranga, a privately owned works at Morrinsville, and the co-operative Southland farmers' works are now under construction.

A Government-sponsored delegation recently visited Japan to report on the possibility of fused calcium magnesium phosphate manufacture in New Zealand, but considered this type of works not suitable for New Zealand at present. Consequently all new production is being planned on the basis of superphosphate manufactured with imported elemental sulphur.

Fertiliser Legislation and Administration

The first legislation which sought to control the standard of fertilisers, the Manure Adulteration Act, was passed in 1892, a year before the English Fertilizers and Feeding Stuffs Act. The 1892 Act and subsequent Fertilizer Acts, which have been administered by the Department of Agriculture, have been aimed at enabling the farmer to know exactly the manurial value of the fertiliser he is buying and to protect him, and the fertiliser industry, from exploitation.

The Department of Agriculture has maintained a close interest in the industry in many ways, including control of the quality of fertilisers, field and plot experiments, extension of existing and new knowledge and techniques, and personal advice to farmers on fertilisers.

Importance of Fertilisers

Though earlier records are not complete, the graph on page 189 gives an approximate reconstruction of fertiliser use from 1885 to the present day. Short-term fluctuations due to the various factors affecting supply and demand are evident, but the general upward trend in use undoubtedly has brought in its train increased production.

Fertilisers have been the foundation on which most improved farm-management practices have been built and have therefore played an important part in the economic development of this country. Indeed, livestock farming based on grassland could never have been developed so rapidly or so intensively as it has been without the contribution of the fertiliser industry.

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Mattresses

By MAUD B. STRAIN,
Field Officer in Rural Sociology,
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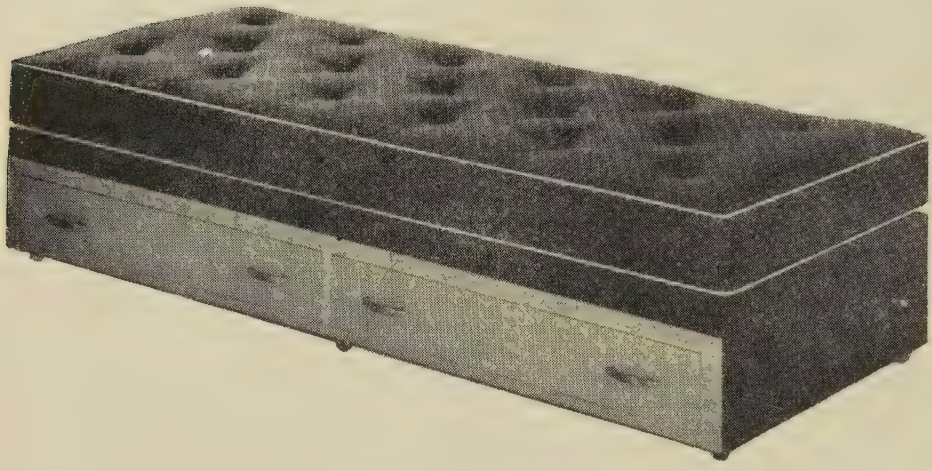
FROM the standpoint of health and comfort the bed is the most important single article of furniture in the house, and it deserves all possible consideration, both in selection and in subsequent care. Though the bedstead may be important aesthetically, the mattress and its support are of paramount importance to the sleeper. The choice of mattress—whether a soft or slightly resistant surface—is individual. Whichever is chosen it is a sound investment to buy a good mattress with well-sprung support which will stand up to long, continued use without sagging or deteriorating.



THOUGH the bedstead may add a decorative note to a bedroom, it is the mattress and its support that contribute directly to the comfort of the sleeper. When the upper mattress is given the correct type of support it forms a yielding surface on which one can relax while the body is supported uniformly and naturally in all positions. Even the most luxurious top mattress will be unsatisfactory if its support is unsatisfactory.

The most usual type of under mattress is the wire mattress in one or other of its forms; however, the present popularity of inner-spring and foam-rubber mattresses has brought about the development of other supports specifically designed for these.

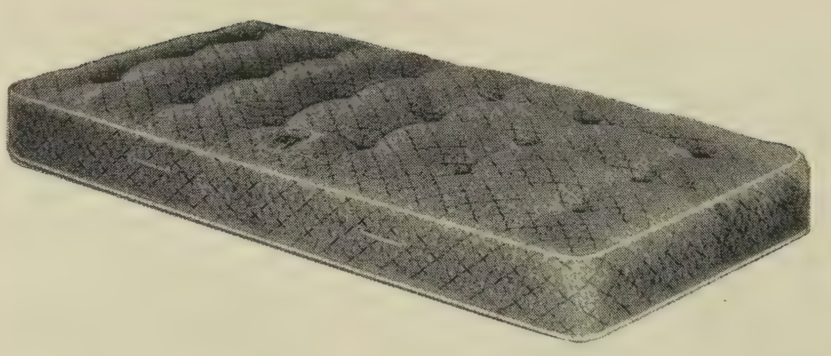
Wire Mattresses

There are three general types of wire mattresses, each of which differs in construction and in comfort.

One type has wire links of a diamond shape mounted in a metal frame. This is a very rigid form of mattress which will stand a large amount of hard wear and is often used in institutions.

There is also the wire-wove mattress made of finer steel wire in the form of long coils. Each coil is interwoven with the next to form a wire fabric

Above and at right—Divan-type mattress supports, each with an inner-spring mattress on top. The divans are sprung similarly to the mattresses except that the springs rest on rigid frameworks. The divan above has drawers to provide storage space for extra bedclothes. The divan at right has a back rest for comfort when it is used as a seat. When the divan is to be used as a bed the back rest may be lowered out of the way. The covering material may be chosen to harmonise with other furnishings in the room. Franz photos.



[Franz

An inner-spring mattress. The two handles on the side provide for the grip which is necessary when the mattress is being turned.

which is secured to a wooden bar at head and foot ends. At one end of the mattress the bar is fixed to a second bar by two large bolts which tighten the wire mesh when necessary by lessening the space between the bars. This is a less rigid type of mattress than the first one and is quite efficient as long as the mattress remains in good order, but it becomes uncomfortable as the mesh sags more and more with wear. Though the mattress can be tightened, eventually the tightening ceases to be effective.

A third type is similar to the second, but has three or four rows of spiral coil springs fixed firmly to wooden slats stretching from side to side of the bed below the level of the wire mattress. The tops of the springs are attached securely to the under surface of the wire mattress and the whole unit forms a resilient support which never sags. Any satisfactory top mattress on this type provides an extremely comfortable surface on which to lie.

The divan-type mattress for use with an inner-spring mattress will be described later. Proper care of the wire mattress not only protects it and other bedding, but maintains the comfort of the bed as well. From time to time it should be examined for flatness, for any upturned ends of wire, and for any rust spots. It should be dusted frequently; the dusting tool of a vacuum cleaner is most satisfactory, but a slender brush can be used.

Previously it was customary always to cover a wire mattress to prevent rust from marking the upholstered mattress and to protect this mattress from any ends of wire that might project upward. However, this semi-permanent covering made inspection and cleaning more troublesome and consequently neglected; dust and fluff accumulated and rust was unnoticed.

A neater and more practical idea is to cover all mattresses that rest on wire.

Upholstered Mattresses

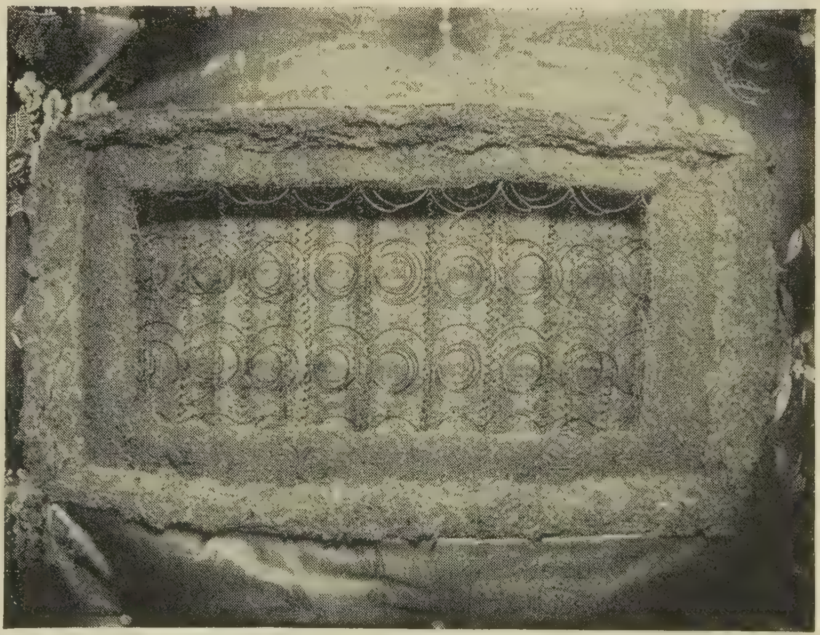
Upholstered mattresses combine with the under mattresses to give sleeping comfort. The filling of a mattress and its construction are the factors which influence its quality. The fillings and construction most commonly used are:—

Flock: This is available in various qualities and prices, the lower-priced ones being largely cotton with a small proportion of wool and the higher-priced ones all wool. Various intermediate grades contain mixtures of cotton and wool. (The cotton comes from India's cotton factories and the wool from waste clippings from woollen factories.) The flock is teased up finely by machine and blown into the previously made cover, a measured quantity for each size of mattress; the mattress is then rolled, pressed flat, and buttoned. Better grades of this type of mattress have boxed sides and rolled edges. Flock, especially the cotton variety, is inclined to absorb moisture from the body and become lumpy. It requires frequent airing and drying out to keep it in good order.

Kapok: This is a fibre obtained from a certain type of tropical tree. It is highly resilient, water resistant and moisture proof, and relatively inexpensive. It makes a comfortable bed and with frequent sunning and airing will give sleeping comfort over a number of years of constant use, but eventually the kapok breaks down and cannot be rejuvenated. To make a kapok mattress finely teased kapok is blown into a cover and pressed flat; the mattress is then buttoned. (The lightness and water-resistant qualities of kapok make it an ideal filling for life jackets used by yachtsmen and others.)

Feathers: Feather beds, once highly regarded because of their softness and warmth, are seldom seen now. Modern hygiene regards them as insanitary, and the surface makes it almost impossible for the sleeper to lie flat and straight. They are heavy and difficult for one person to shake and manage properly, but become lumpy if not well shaken and properly looked after.

Horsehair: This is another mattress filling that is now seldom used in the manner it was originally used. It is expensive but ideal because it pos-



The construction of an inner-spring mattress. The springs are covered with a layer of fibre needled into hessian, and this is covered with a layer of wool and finally a damask cover.

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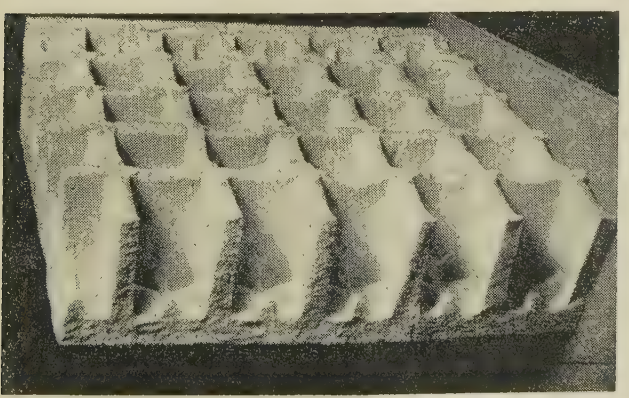
sesses great resiliency, allows good air circulation, and does not pack easily or become lumpy. Horsehair mattresses that have lost their resiliency can be remade with good results. A modern use of horsehair is in conjunction with rubber. Horsehair is moulded in rubber, and the combination gives added spring and toughness to upholstered furniture in which it is used.

Inner-spring mattresses: These provide a flat surface and good sleeping comfort. They are firm but resilient. A double thickness of blanket between the bottom sheet and the mattress gives extra warmth and comfort.

These mattresses consist of a large number of spiral springs (up to 360 in a double mattress) joined together and padded above and below with fibre and wool. This upholstered network of springs is encased in a cotton, or cotton-rayon, damask cover with handles at each side to facilitate turning and ventilation holes to ensure free circulation of air. This type of mattress must never be bent or rolled; it should be turned occasionally by two people working together and keeping the mattress flat while turning it. Mattresses are now available with built-in heating units; the cost is high but the elements are reliable.

Foam - rubber: The foam-rubber mattress is the most recently introduced one, being used extensively only during the last 10 years or so. It is extremely resilient, conforms to the body contours, and does not form slopes and hollows as does an ordinary mattress. Other advantages are light weight, stability of contour, freedom from allergenic materials, and resistance to mildew and vermin; also it needs no turning. At least two thicknesses of blanket should separate the lower sheet from the mattress; this adds to the warmth and diminishes the tendency for the sheet to slip. Mattresses are available with built-in heat units.



Cross-section of a piece of cavity sheet as used for foam-rubber mattresses.

A rubber mattress retains its resilience and appearance through many years of constant use.

Mounting

Every mattress should have appropriate support. For unsprung mattresses any of the wire mattresses supplies the required resilience. For a foam-rubber mattress, which itself provides all the resilience necessary for comfort, a slat base is satisfactory, as it gives complete, non-sagging support and, incidentally, good air circulation. A wire-wove mattress that is taut and in good repair is entirely satisfactory, but one that sags and cannot be tightened should be discarded.

An inner-spring mattress functions best on a firm, yielding, but non-sagging support such as is provided by a slat base. A wire-wove mattress in new condition is satisfactory, but in recent years a special divan-type support has been introduced. This is made similarly to the inner-spring mattress except that the springs rest on a rigid wooden base. This type of support appears in two forms—either as a mattress, interchangeable with a wire mattress, to fit between the headboard and footboard of a bed or as a divan. This latter type is particularly suitable for a spare bed in a sitting room, since by day the divan can be fitted with tailored covers that will accord with other furnishings in the room and at night it becomes a comfortable bed. A divan is available if desired with two large drawers for storage of extra bedding.

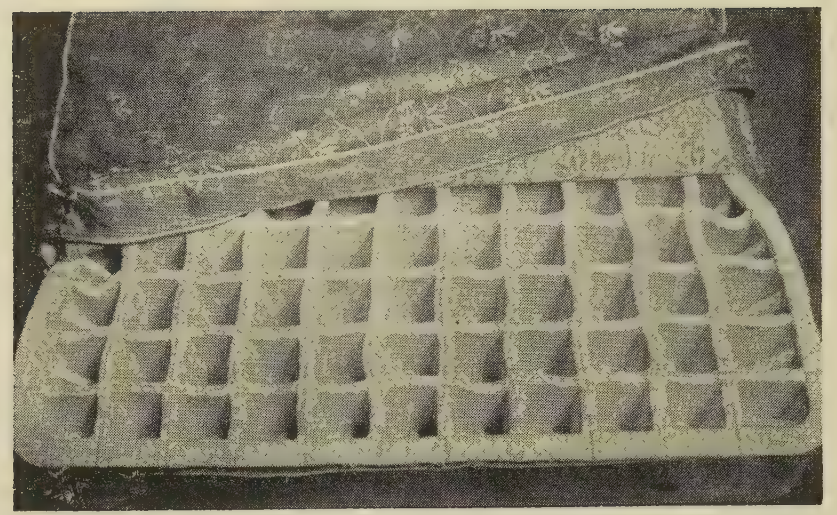
Ticking

The ticking used for any mattress should be strong and durable, cotton and cotton-rayon mixtures being most usual. For a foam-rubber mattress a tight ticking is preferable to a loose one. Colour fastness is important. A plain edge on a mattress is as serviceable as a rolled edge and is less expensive to make. Tufts to prevent undue shifting of a mattress filling should be about 12in. apart.

Covers

All mattresses that rest on wire should be covered. The cover keeps the ticking clean and protects it from damage. A cover can be easily washed. One made from pre-shrunk material is obviously advisable. The most usual material for covers is unbleached twilled calico, though other fabrics serve equally well. The mattress case is a neater and more practical idea than the older method of covering the wire with an old blanket or newspapers.

Before washing a mattress cover choose a good drying day, close all



Covers for foam-rubber mattresses are tight fitting to ensure a trim, sleek look and to prevent covers from slipping. This is the under surface of a mattress.

fasteners, wash the cover in hot soapy water, rinse it thoroughly, and when it is almost dry pull it to its proper shape before pressing it.

Pads

A mattress pad should always be used between the mattress and the bottom sheet to protect the mattress from soil and wear. It may be a ready-made pad or simply a folded cotton or wool blanket or any large soft piece of cloth that can be laundered satisfactorily. The main function of the pad is to protect the mattress, but while doing this it also adds to the warmth, particularly with a mattress such as an inner-spring or foam-rubber mattress, where the sleeper lies on the mattress instead of sinking into it.

Maintenance

Mattresses should be kept dry and free from dampness. Solid-filled mattresses (not rubber) should be frequently exposed to fresh air and sunshine to freshen them and dry them out thoroughly. They should be brushed regularly, or, better still, cleaned with a vacuum cleaner attachment, special care being taken to clean under and round the tufts.

Upholstered mattresses should be turned regularly from side to side and from end to end. Turning distributes the hardest wear and helps to prevent packing or lumping of the filling and hollowing due to constant use in one position. A mattress should be kept flat when turned, since bending may snap the tufting ties. Any broken tufting ties in either a solid-filled or inner-spring mattress should be replaced immediately.

The habit of sitting on the edge of the bed should be discouraged. The boxing of the mattress is not built to stand this kind of wear, and once it is broken down the bed cannot be made to look smart and squared. One or two comfortable low chairs in a bedroom will encourage the use of a chair rather than the edge of the bed. Tears or snags in the ticking should be repaired as soon as possible.

Inner-spring mattresses should be cared for in much the same way as are solid-filled mattresses. Perhaps the most important care is correct turning. An inner-spring mattress does not require frequent turning, because it does not tend to pack as does a solid filled one and it is so constructed that air can flow in and out to keep it fresh.

Two persons are required to turn an inner-spring mattress to ensure that it will not be bent or folded. Bending or folding is likely to upset the nesting of the coils and to break the tufting. When a mattress is being lifted or turned it is advisable to make use of the handles provided. Loosened tufts and broken ties should be replaced immediately. If any coils of a spring mattress become dislodged or protrude through the ticking, the mattress may have to be rebuilt.

Foam rubber is adversely affected by strong sunlight and by oils and greases. A rubber mattress should not be put out in the sun to air and it should not be left exposed to strong sunlight in the bedroom, but it will come to no harm in a sunny room as long as the bedclothes cover it. To prevent it from coming in contact with any oil or grease a rubber mattress is always covered with ticking. This type of mattress can be changed end for end, but it is not reversible; the flat, smooth surface should always be on top. Sleeping on the reverse side could eventually break down the walls of the large cells.

Spot Removal

Soiled spots on a mattress are difficult to remove. The best method is to sponge the spot with warm soapy water and then wipe it with clean warm water, using as little water as possible. This should be done quickly. If the water wets the filling underneath the ticking, a bad stain or ring usually results. An electric fan directed toward a wet spot on a mattress or a warm breeze from out of doors hastens drying and helps prevent ring formation on the ticking.

Repairs

The chief reason for mattresses becoming uncomfortable is that the stuffing becomes tightly packed down and loses its resiliency. Feather beds are perhaps an exception, since they usually keep their good condition for many years if well cared for, only needing a new ticking when the feathers show signs of working through. Very little can be done at home to rejuvenate a badly worn flock mattress, as this form of stuffing must be removed from its cover and teased by machinery, more flock being added if required. It can be improved to a certain extent by beating it hard all over with a carpet beater, particularly on the sides, then vacuum cleaning thoroughly to remove loose dust. This should be done out of doors.

Renewing Buttons and Tufts

When necessary, buttons and tufts should be replaced as soon as possible; otherwise the mattress becomes lumpy and uneven because the stuffing gets out of place. To do this a mattress or upholstery needle is threaded with strong, fine string or upholstery thread and passed through the mattress at the point where the tuft is needed. Sometimes a leather circle is used instead of a tuft because it is flatter and stronger, and for this the needle is passed through the centre of the leather and back again through another hole about ¼in. away and again through the mattress near the point where it first went in. The thread is pulled reasonably tightly, and the needle is run through another circle and back again so that the ends of the thread are between the mattress and the leather. The ends should be pulled tightly together and tied off securely.

Storage

Mattresses may be hung by the side boxing or placed on a flat surface. No more than one mattress should rest on top of another. Mattresses should never be rolled or hung over a clothes line. They should be stored in a dry, well-ventilated space and covered with old sheets or other covers to protect them from dust.

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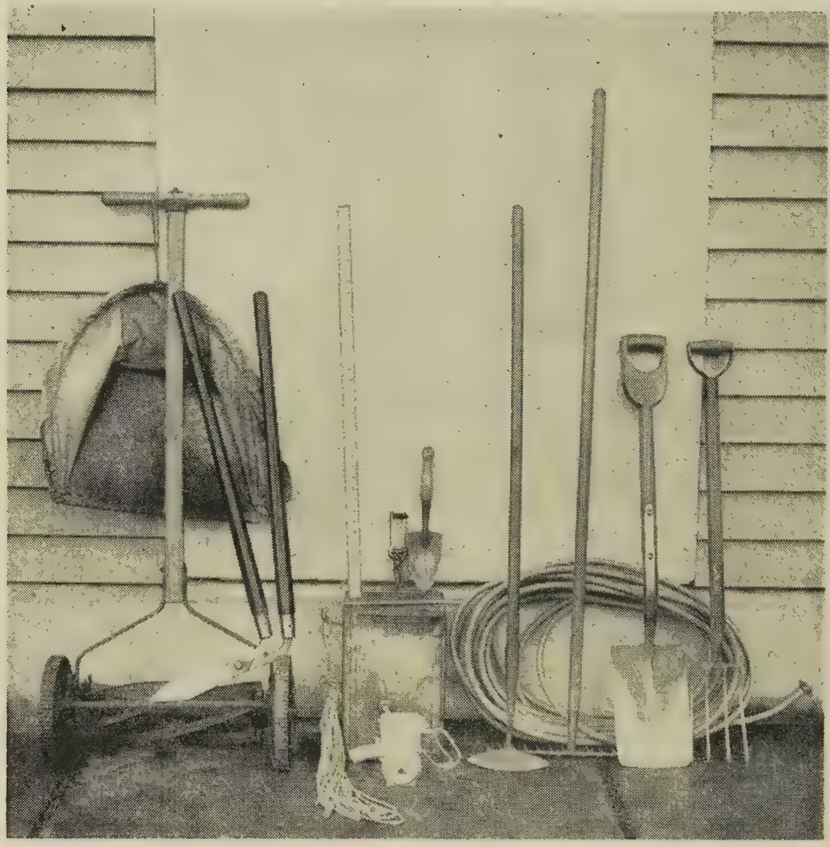
Tools and Equipment for Flower Garden



THE range of tools and equipment necessary for work in the flower garden is not extensive and good tools last for many years. In this article K. H. Marcussen, Horticulturist, Department of Agriculture, Christchurch, discusses the most suitable types, their uses, care, and the dangers of mismanagement and carelessness in their use. The garden work notes for September are by Rosalie A. Campion, Horticultural Instructor, Department of Agriculture, Wellington.

ONCE a flower garden has been laid out heavy tools are seldom required and apart from a good, strong spade light tools are most satisfactory. There is a big range available, some of which have limited use, but they make work easier and are more efficient for a specialised job.

Many tools are now obtainable in stainless steel and though they are expensive, they are well worth buying. They not only do not rust, but under all conditions are easier to work with. The clogging of ordinary spades or hoes when work is being done in moist ground seldom occurs when stainless steel tools are used.

On this page is shown a selection of tools which can be considered a minimum for maintaining a flower garden containing lawns, flower borders, roses, and shrubs.

The Spade

Though no tool can be singled out as the most important one, special consideration should be given to the spade.

Digging with a spade can be hard work; that is probably why many gardeners prefer a long-handled shovel.

A spade should be light but strong and be clean and free of rust. The blade should be at a slight angle, bending forward from the handle, and it should be moderately sharp.

The angle of the blade in relation to the handle is important; the less the angle the harder it is to keep the soil on the blade when digging.

Sharpening a spade. The full length of the file face should be used in each stroke when sharpening garden tools. The file should be held flat on the bevelled edge and in each stroke should traverse the bevelled edge as far as possible.

A spade can be used for other work such as throwing soil back from grass edges when flower beds have been cultivated, or straightening a turf edge if an edging iron is not available.

If a spade or any other tool becomes rusty, it should be cleaned. This can be done by rubbing the blade with a piece of pumice or a corner of a brick, plenty of water being used. To prevent rust reappearing the metal should be rubbed over with an oily rag before the tool is put away.

The Fork

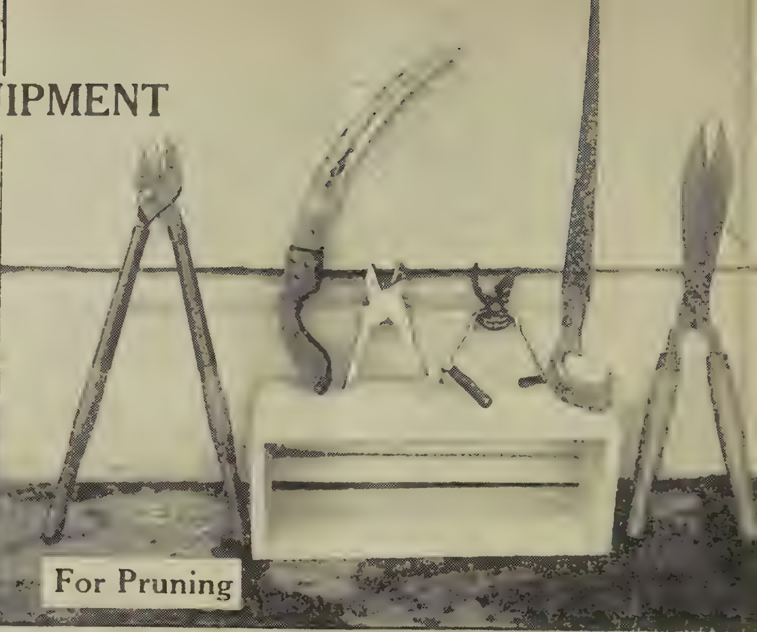
Of the many types of fork the one commonly called the lady's fork is the most useful in the flower garden. It can be used for light cultivation, such as pricking up, which is done to aerate beds during wet periods when hoeing is not practicable. For lifting bulbs and herbaceous plants it is invaluable, as too much damage can result when a spade is used.

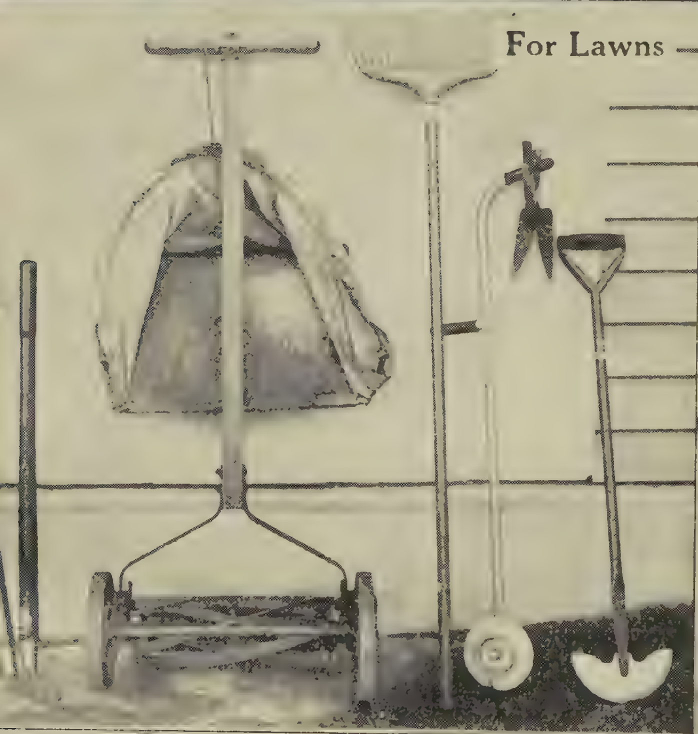
The Hoe

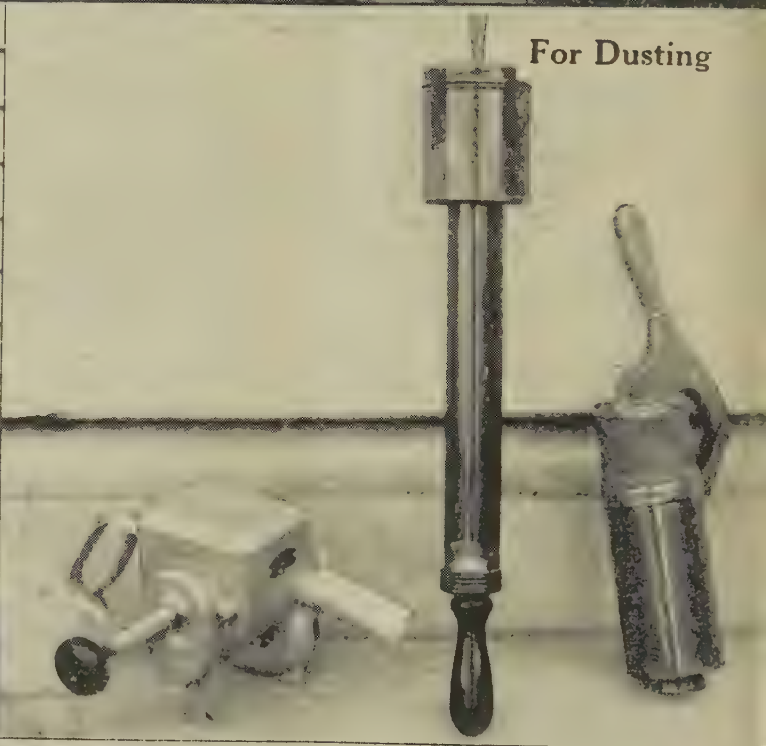
The torpedo-shaped push hoe cuts weeds in both forward and backward movements, provided both edges are sharp. The chance of damage to the plants should not be overlooked and some people prefer to use a push hoe with blunt ends at right angles to the cutting edge.

FLOWER GARDEN
TOOLS AND EQUIPMENT

For Watering


For Pruning


For Lawns


For Dusting

For Spraying

Hand Tools

For gardeners who prefer to use a chop hoe a light type manufactured in New Zealand is an improvement on the type commonly seen.

By frequent hoeing weeds are prevented from becoming established, and because the surface is kept open, aeration of the soil is facilitated; this is of great benefit to plants. Greater oxidation of organic matter occurs and this loss should be replaced by frequent application to keep the soil in good heart.

The Rake

The main use of the iron rake is for levelling soil and removing debris. Again, a lightly constructed tool can be recommended. When the back of the rake forms a plain, straight edge this is useful for marking before planting. In the autumn overhaul of lawns the rake is generally used for scarifying the turf. There are special rakes more suitable for gathering leaves; one constructed of plastic is shown on page 204.

Rakes left lying around are a menace, especially for children, particularly when the prongs are pointing up. They should be placed against a building, fence, or shrub, with the teeth facing in.

Garden Line and Measure

It is not possible to make anything straight in the garden without a line, and for it to be placed correctly distances must be measured. A good, stout garden line will last for years and is a good investment. Three foot rulers are excellent for garden use.

Hand Tools

A trowel is a necessity for satisfactory planting of small subjects, such as bedding plants. Various types are available, but the common half-round type, shown on page 204, is the most useful.

A bricklayer's pointing trowel is better for dealing with very small plants, and where bedding plants are set out from boxes this type will be found excellent for cutting the individual plants out in blocks, when the soil will adhere better to the roots.

Sometimes a dibble is used when plants are shifted directly from the seed-bed to the growing position. Dibbles can be bought with metal-covered tips; these are much better to work with, as the soil does not stick as it may on wood.

A hand fork is very useful for working the soil round small plants where it is not possible to use a hoe or larger fork. Chromium-plated trowel and fork sets are available.

Tools for Lawn Care

The most expensive tool for care of the lawn is the mower. Many home gardeners have motor mowers and, in general, these are much better cared for than hand mowers. However, a well-kept mower lasts years longer and does better work with less effort.

Greasing and oiling should be done frequently in the places which can readily be seen. In large gardens this may be desirable every time the mower is used; for small gardens it may not be necessary, but it is better done too frequently than not often enough. Occasionally the wheels should be taken off a hand mower and the running parts cleaned and given new grease.

Sharpening of mowers should not be done by amateurs, but the setting may have to be attended to from time to time. The part of the mower which is adjusted for the setting is usually the bottom plate and not the cutting cylinder.

When adjustment is required the nuts on the main bolt of the bottom plate are loosened, as the blade is pivoted on that. Four adjusting bolts, one placed at each corner of the plate, are then adjusted so that an even cut is obtained along the full length of the cylinder. This can be tested by cutting a piece of paper. The four adjusting bolts should all be firm after the plate is set and finally the nuts on the main bolt are tightened. The positions of these parts are shown on page 207.

To set the height of the mower the roller is moved up or down. To make the cut even both ends must be set the same; the alignment should be taken from the bottom plate.

A new type of motor mower has been available for a number of years. The grass is cut by small knives placed on a bar or disc which is rotated parallel with the surface of the turf. This type of mower does an excellent job, especially on grass that is too long to be cut with a cylinder-cutting mower.

The mower can, however, be dangerous. The individual knives are fixed with two bolts. These bolts can become worn by grinding on stones and should they come off while the mower is operating, the knives may be hurled away and cause a nasty accident. These bolts require frequent inspection. Accidents can also occur through carelessness. The knives rotate with a great speed and will cut everything. No work should ever be done to the machine nor should it be lifted while the motor is working as it is easy to get a foot into range of the knives. Under no circumstances should these motor mowers be left unattended while the motor is running.

A lawn looks more attractive if it has neat edges. These can be shaped with a spade or with a special edging iron, such as that shown on the right side of the illustration of lawn tools on page 204. Whichever tool is used it must be sharp or the edge cannot be made even. It is much easier to do this job when the turf is moist. When an edging iron is used the flat side should be facing the turf.

If a straight edge is being cut, a straight piece of timber placed alongside the line will assist greatly in keeping the cut even. Professional gardeners use planks with holes in both ends so that they can be pegged into position.

For curved edges, a hose is useful for giving an over-all impression of the cut, but care should be taken that the hose is not pushed out of position during the operation.

▼ Don't leave rakes lying about; they are dangerous.

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To keep a garden at its best the lawn edges should be trimmed after each mowing. That is a small job with a pair of long-handled edging shears. For positions against walls or fences where it is not possible to cut close with the mower hand shears can be used. The type shown on page 204 is less tiring to use than sheep shears. Where a lawn borders a concrete path the grass is often left untidy. The hand shears can be used for cutting in these places, but the wheel cutter shown on page 204 makes the job easier.

The ordinary iron rake is not very satisfactory for cleaning light rubbish such as leaves and twigs off lawns. Special types are available for this job and they should be used with a sweeping movement to prevent breakage.

Watering Equipment

In most districts a garden hose is essential. Various types of plastic hoses are now available besides rubber hoses. Plastic hoses have the advantage of being light in weight, but some types become stiff in cold weather, when they can be difficult to roll after use. Kinks can cause trouble if the hose is left on the ground or lawn while the water is turned on.

There are many types of sprinklers and one should be chosen to suit the size of the garden.

Perforated plastic hoses are useful for laying between plants where a good soaking is required. They should be turned on slowly; if full pressure is turned on before the hose is filled with water, it is possible to blow the end out.

A good substitute for a perforated hose can be made by drilling fine holes in a length of galvanised pipe, as shown in the illustration on page 204.

For watering isolated plants and seedlings a watering can is useful, but the common types have not a fine enough rose for satisfactory use on a new seed-bed or very fine seedlings. For this purpose the small imported cans are best. Both of these types are shown in the top-left illustration on page 204.

Pruning Equipment

The pruning equipment required in any flower garden will depend on the plants growing in it, but in general no such drastic pruning is required as in the orchard. The correct tool for pruning is very important, as too small a tool will make any job difficult. A selection of pruning equipment is shown on page 204.

For gardens with hedges hedge clippers are, of course, a necessity. They are intended for cutting soft growth, not mature wood. A pair with a notch for branch cutting is handy, but, in general, it is better to cut branches with a pair of secateurs. Like all clippers and shears they should be kept well oiled and adjusted. The correct washer should be fitted to the bolt to prevent the nut from working loose. Hedge clippers are intended to be used pointing away from the operator; otherwise they can cause accidents.

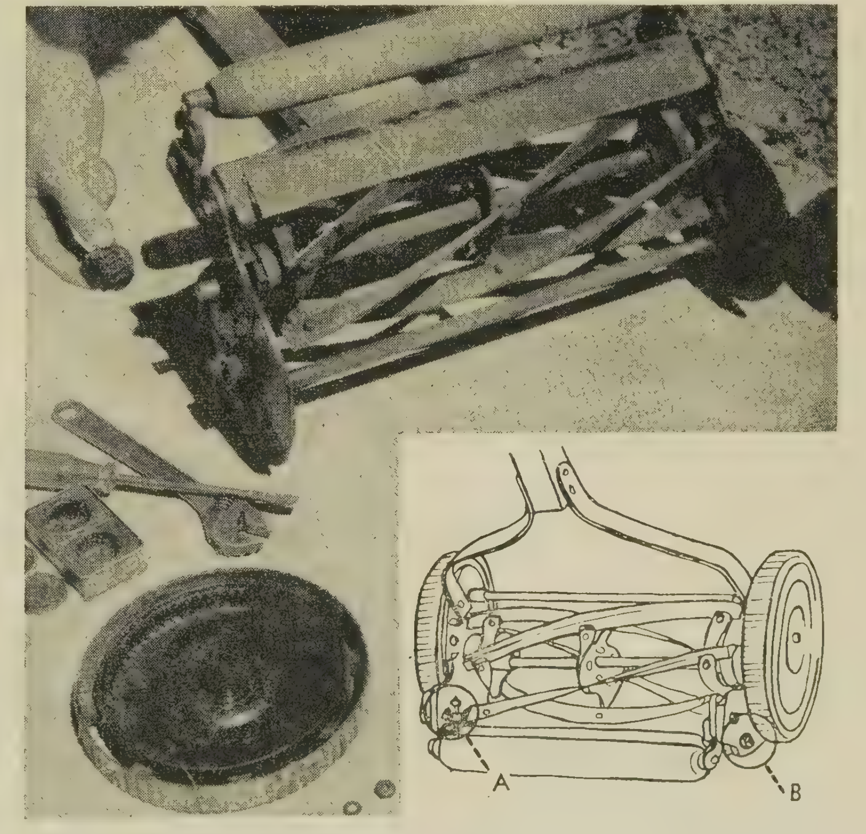
Of the different kinds of secateurs that easiest to use is the type in which a blade is cutting against a soft metal bed or anvil. It is satisfactory for most work, but the pressing of the wood against the metal anvil will cause bruising on soft-wooded plants. Where a clean and close cut is essential, for example on roses, the parrot-beak type is superior. With this type one side of the branch is resting against a heavy jaw. This will cause bruising and the secateurs should always be used so that the clean cut is on the part remaining on the plant. Both types are shown in the illustration on page 204.

If a branch is too thick to cut with secateurs, it should not be attempted. Cutting with a twisting movement may spoil the alignment of the cutting blade, after which a clean cut will not be possible. Branch cutters are designed for such jobs.

Pruning work in most flower gardens does not warrant the purchase of branch cutters, and any branches which are too large for secateurs can be cut with a saw.

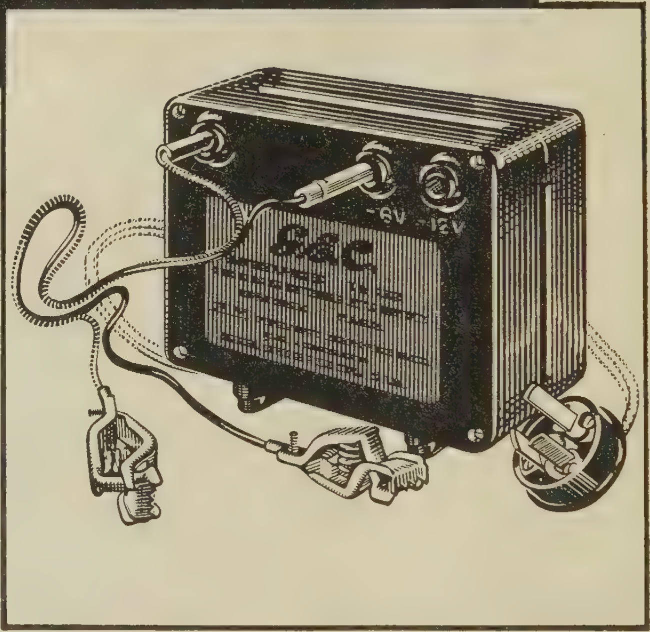
There are many kinds of pruning saws. The choice should rest on which one will do the job without damage to other parts of the plant. The type with two saw edges is seldom suitable for use in the flower garden; the upper edge will usually catch in other branches when branches of shrubs and roses are being sawn. The end should be pointed so that the saw can be used in confined positions. The size of the teeth is not important, but the setting should be fairly fine. Straight and curved types are available, both of which are shown on page 204.

Finally, a strong knife is necessary to trim any rough edges remaining after sawing.



The running parts of a mower should be checked periodically. Inset—Parts to be adjusted to set the cut of a hand mower. A—Adjusting bolts. B—Nut on main bolt.

ELECTRIC FENCE AND VEHICLE BATTERY CHARGER



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Dusting

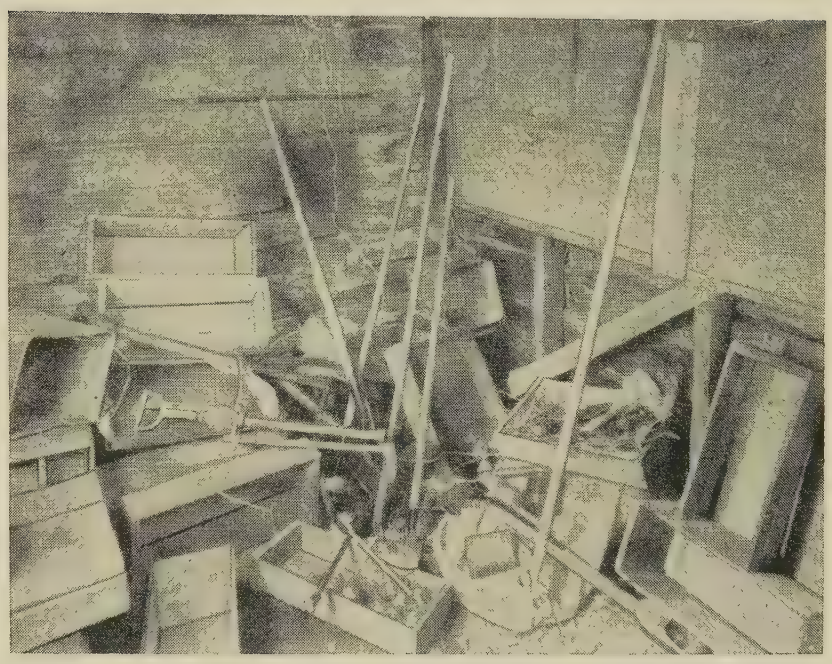
Dusting as a control measure against pests and diseases in the flower garden has the main advantage of simplicity and speed. The dusts can be mixed at the beginning of the season or purchased ready for use. Thorough cleaning of the duster is not necessary after each use and dusting can be carried out, therefore, in a fraction of the time required for spraying.

Some types of dusters are shown in the illustration on page 204.

The rotary-fan type is undoubtedly the most satisfactory, throwing a cloud to about 8ft. The output can be regulated by the speed of operation. Because of even distribution it is economical in use. Greasing should be done by filling the grease cap, and occasionally the side where the handle is fixed should be removed and the revolving parts greased.

The plunger type has a separate chamber for the dust, through which air is forced by pumping; this forces a cloud of dust through the nozzle. This type is available in many makes and sizes. They will not provide such an even flow of dust as the rotary-fan dusters, but are much cheaper.

The bellows type works on the same principle as the plunger type, but is operated by shaking.



Does your tool shed look like this one, or do you clean and oil tools before hanging them up in their proper places?

Spray Pumps

Pest and disease control in the flower garden may in some places be a small job compared to that in the vegetable garden and orchard. Spraying equipment may, however, also have to be used for these sections of the garden and purchase of a knapsack sprayer may be necessary. Larger equipment will seldom be essential in a home garden.

There are two types of knapsack sprayers—the low- and high-pressure types. The low-pressure type, shown on page 204, has the pressure chamber built into the tank. This type is quite satisfactory in most gardens. The high-pressure type has the pressure chamber fitted to the outside of the tank. Both types supply a continuous volume of spray on being pumped.

Two types of nozzles are in use. The bordeaux nozzle, which can be readily adjusted for a spray or jet output, seldom blocks up. The cyclone nozzle, which is frequently double headed, provides a finer spray than the bordeaux nozzle and is therefore generally preferred for the flower garden.

Blockages of the aperture sometimes occur, but by the unscrewing of the cap it can quickly be cleaned. A closed disc is usually attached on the side of a double-headed nozzle, whereby one of the nozzles can be put out of action if a small output only is required. A useful feature is that the angle of the spray cone in relation to the rod can be changed on some cyclone nozzles, facilitating a better cover on different kinds of plants.

A strainer is supplied for use when the tank is filled and another is placed in the delivery rod. Both should be kept clean.

Extension rods for knapsack sprayers are available for spraying tall subjects.

Bucket pumps are much cheaper than knapsack sprayers. The suction end of the pump is placed in a bucket with spraying material and is kept in position by a foot placed on the fixture on the outside. The pump usually operates with a continuous output and is quite efficient. Bordeaux or cyclone nozzles, as described, can be fitted.

The main disadvantage of bucket pumps is lack of mobility, as they are constructed for the operator to stand alongside the bucket pumping with one hand and spraying with the other. This drawback can be overcome by the fitting of a longer hose between the pump and the spraying rod and operating it with two persons.

Hand syringes, some with several different nozzles, are available. They are filled by sucking the spray material into the chamber from a bucket, after which it is forced out in a spray. They are slower and more laborious to work than bucket pumps.

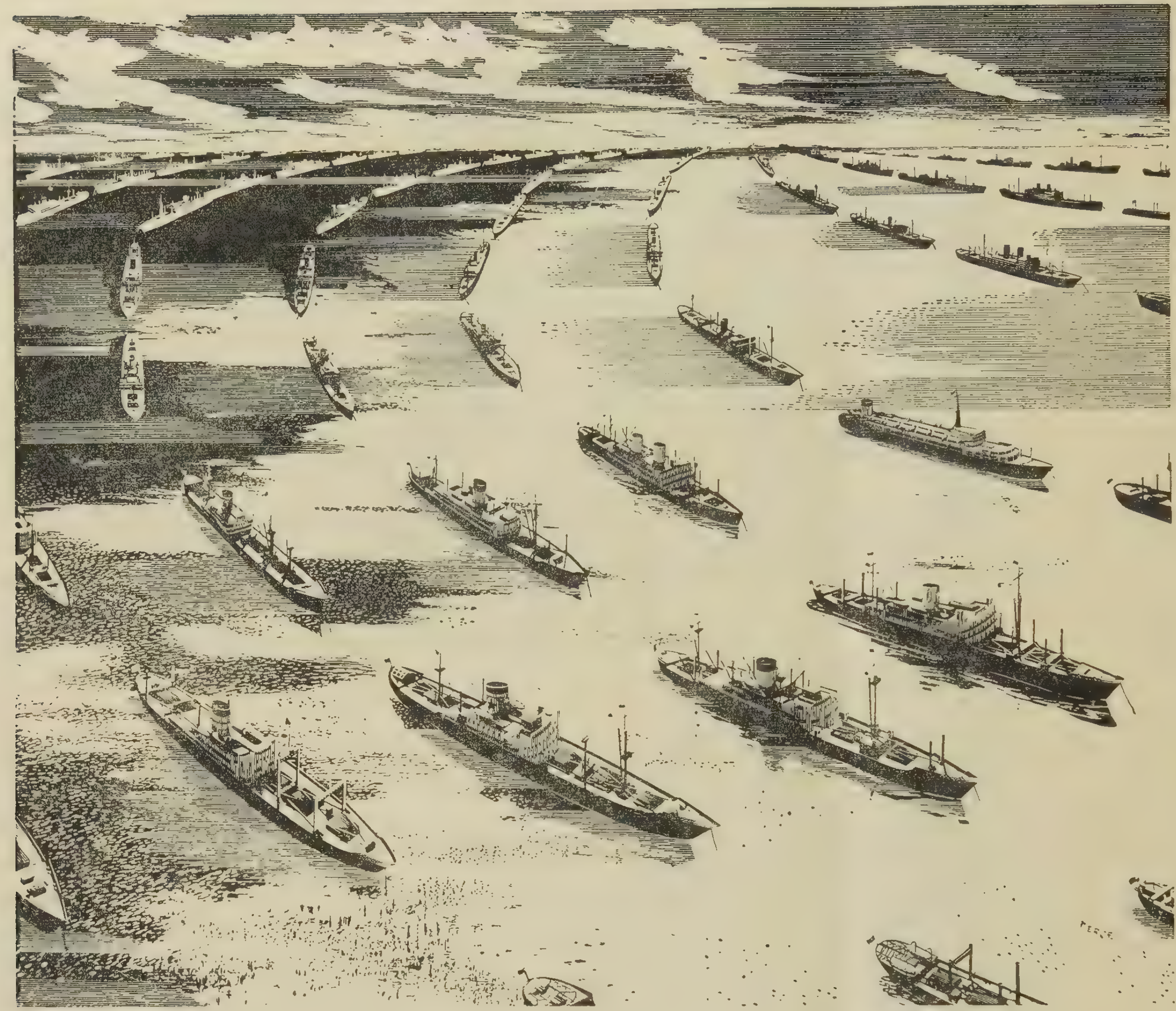
Several types of atomisers are used for spraying. Their main use is for damping down in a glasshouse, but they can be used for spraying smaller plants, especially with volatile insecticides, such as nicotine sulphate. Care should always be taken that no solids are put into them, as the jets block easily. Of the two kinds one is pumped during the operation and the other is constructed with a pressure chamber so that it can be pumped up before spraying begins.

No matter which kind of sprayer is used, hygiene should always be thorough. Some spray materials are corrosive and though the materials used in the manufacture of spray equipment are fairly resistant, they may be damaged if not thoroughly cleaned after use.

As hormone weedkillers are very difficult to remove from spray equipment and some plants are susceptible to the smallest trace of hormone, the use of hormone weedkillers in general-purpose spraying equipment cannot be recommended. Preferably a separate sprayer or watering can should be kept for weedkillers and marked so that it is not confused with the usual equipment.

To measure exactly the materials a gallon measure or a bucket or tin of known capacity should be available. A graduated measuring glass should be kept for measuring liquid concentrate material, and a small set of scales will be very useful for measuring dry materials.

Most spray materials are poisonous. They should be placed out of reach of children, and empty containers should be destroyed and disposed of so that no harm can result.



The sight that no one will ever see

If the ships of the New Zealand Overseas Shipping Lines used on the homeward run in 1956 could take time off and gather together, this is the picture they would present. . . .You would see, lying at anchor, no less than 91 ships which were required during the year to provide the 146 sailings from this country (this does not include any additional sailings by vessels chartered from other Lines). In size, the ships range from the "Dominion Monarch" of 26,463 tons to the "Napier Star" of 7,165 tons. Their carrying capacity, all told, is 415,213 tons of refrigerated cargo, 205,394 tons of wool and general cargo, plus accommodation for some 5,000 passengers. They represent a capital investment of about £90,000,000, but to replace them at today's prices would cost roughly £200,000,000. So great a fleet would make a fine show, but no one will ever see it. For these ships are on active service, carrying the trade upon which we all depend. During 1956, they linked ten New Zealand ports with 34 ports in the British Isles, the continent of Europe, the Mediterranean, the eastern seaboard of North America, the West Indies and other parts of the world. And so, on every day of the year, the ships we picture here are scattered in the ports and across the seas of the world, going steadily about their business . . .
. . . which is, of course, your *business, too.*

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Handling of Flowers

When flowers are cut for interior decoration a receptacle should be used. A shopping basket may provide sufficient space, but for larger quantities a special flower basket will be useful.

The flowers will be in better condition if they are placed directly in a basket after cutting than if they are carried by hand or on the arm. Less damage will be done to the plant if a small pair of secateurs is used for cutting.

Handling Garden Rubbish

The type of equipment to use for taking rubbish away mostly depends on the quantity. Double work is given if it is thrown on the ground or lawn and cleaned up afterward. It is just as easy to place it on a piece of scrim. By gripping the four corners of a fair-sized bundle it can be carried, as garden rubbish is seldom heavy.

For large quantities of rubbish and for manure or compost a wheelbarrow can be used, if available. The extra money required for a pneumatic-tyred wheel will be well spent, as the barrow is much easier to push and it does not cut into soil or lawns.

For collection of small rubbish a bucket is very satisfactory. In fact two should be available, one for material to be placed on the compost heap and the other for material to be destroyed. When 4-gallon tins are used in the garden a solid handle should be provided, and if they are painted inside with bituminous or other rust-preventing paint, they will last much longer.

Garden Work for September

Spring bedding plants will be making a fine display now, and a light forking or careful hoeing will aerate the soil and improve the appearance of the beds. Cinerarias should be given liquid manure and a spray of arsenate of lead or DDT to prevent the ravages of woolly-bear caterpillar, the larvae stage of the magpie moth. If the ragwort leafminer has appeared on cinerarias, sprays of nicotine sulphate or lindane should be applied.

All dead flower heads should be removed from Iceland poppies, ranunculus, and anemone to prolong flowering. Lily of the valley will be improved by applications of liquid manure.

Where autumn preparation for spring sowing of lawns was carried out seed should be sown now. Established lawns can be topdressed by routine applications of a mixture of 3 parts of sulphate of ammonia and 1 part of superphosphate at 1oz. per square yard.

SOWING SEED OF ANNUALS

Sowing seed of annuals in vacant areas. A $\frac{1}{2}$in. layer of soil is scooped to one side. The seed is then sown and thinly covered with soil. Note the friable soil in which the seed has been sown.

Care of Perennials

Where soil conditions permitted many perennial plants will have been divided last month. Such plants as violets, gerberas, scabious, delphiniums, and michaelmas daisies can still be divided and replanted in enriched soil. When polyanthus and primulas have finished flowering they should be heeled in close together in an unused shady place for a summer rest.

The perennial forget-me-not (*Anchusa azurea*), *Anemone japonica*, perennial phlox, and oriental poppies may all be increased by root cuttings made at this time. Pieces about 3in. long can be planted out and will soon grow into a new plant. A peg should be put beside the cuttings as they are planted.

Strong growths will be appearing on established perennial clumps. Where growths are too crowded they should be thinned out, weak and unwanted shoots being removed completely at their bases. If required, these rooted shoots can be used to form new plants. This is the best way to obtain chrysanthemum plants, the old clump then being discarded. Where chrysanthemum leaf eelworm caused purple or brown dead areas between the veins last season the old plants should be cleaned of soil and held in hot water at 115 degrees F. for 5 minutes and then washed in cold water before they are replanted to produce cuttings. Replant in clean ground. Where plants were attacked by chrysanthemum gall midge, cuttings should be dipped in either lindane or DDT emulsion.

Seed Sowing

Seed sowing should be a priority job this month, as the ground is warming up. The warmth encourages the germination of weed seeds also and these should be kept in check.

Seeds of hardy annuals can now be sown outside. Though some thrive on comparatively poor soil, most prefer a well-cultivated soil rich in organic matter. The soil should be friable and broken to a fine tilth before the seeds are thinly sown. The seed may be broadcast and raked in or sown in drills. It is probably better to scoop a $\frac{1}{2}$in. layer of the soil to one side of the area to be sown and after it is sown gently cover the seed with this soil.

Where frames or cloches are available sowings of the more tender plants such as petunias, salvias, dahlias, *Phlox drummondi*, livingstone daisies, zinnias, nemesia, asters, and dimorphotheca can be made.

Pricking out and Planting out

The more tender subjects which were sown under glass last month can be pricked out 2in. to 3in. apart as soon as they have two true leaves. The boxes, which should be replaced under the glass for about 2 weeks until the plants are established, can be filled with a good compost consisting of 7 parts of good turfy loam, 3 parts of compost peat, leafmould, or well-rotted cow manure, and 2 parts of coarse sand.

To every bushel of the mixture, about the amount which will fill an apple case, add ¾oz. of lime and 5oz. of a base fertiliser, which can be made by thoroughly mixing 2oz. by weight of dried blood, 2oz. by weight of superphosphate, and 1oz. by weight of sulphate of potash.

Seedlings which were sown in situ outside last month may need thinning to about 6in. apart to ensure adequate light and nutrients for good plant development. If it is desired to transplant some of these seedlings, they should be left until they are 2in. tall before being transplanted. It may be necessary to thin out the plants to allow them to grow sturdily to this size.

Spring Flowering Bulbs

With most spring flowering bulbs now reaching perfection and not when the bulbs are in the shops in early autumn it is time to give consideration to the choice of varieties for future planting. If it is possible, visit a bulb nursery and see the bulbs during flowering, or take the names of desired blooms as they are displayed at flower shows and place orders as soon as possible to ensure delivery.

When the blooms fade remove the flower heads, but do not cut off the foliage, which is necessary to feed the bulb for next year's blooming. Long leaves may be tied to give a neat appearance. It is desirable to spray narcissus, hyacinth, amaryllis, and iris at ground level with DDT wettable powder as a protection against the females of the narcissus bulb flies, which lay their eggs during spring at the bases of the leaves or on the necks of the bulbs.

Spring Planting Bulbs

Though autumn is regarded as bulb-planting time, there are several bulbs which should be planted now.

Acidanthera: These plants are very closely related to and often grouped among gladiolus. The bulbs require dry, airy storage and can be planted from now until Christmas. Old, diseased corms should be discarded, but clean corms and cormlets can be planted and expected to flower in the first year.

Agapanthus: This tuberous-rooted plant should be cut into clumps, each with a few buds. Planting should be 3in. to 4in. deep.

Alstromeria (Peruvian lily): The tubers should only be lifted and divided when they become crowded. There are several colours. The thickened roots should be planted 4in. deep in rich soil. Care should be taken when lifting and dividing the roots that these are not broken.

Begonia, tuberous: These can be started into growth in boxes of leafmould to which a little bone flour has been added. They should be protected by glass until early summer.

Canna: Old plants can be lifted and broken up, leaving several buds to each tuber. They should be planted 2in. deep in a good soil in a sunny aspect. The plants should be spaced 1½ft. to 3ft. apart, depending on the height of the variety.

Clivia: Lift and replant at the same level in a place where they will be partially shaded.

Crinum: Lift and replant 1in. deep.

Dahlias: Clumps of tubers which have been lifted and stored during winter can be placed in a warm, moist place to develop sprouts. Boxes of moist sawdust are excellent for holding the tubers. Smaller plants usually give better but later flowers, and when the shoots are developing, individual tubers with one or two good shoots should be severed and planted in beds which have been well enriched with organic matter. Strong stakes should be inserted before tubers are planted.

Galtonia candicans: Bulbs can be planted 4in. to 6in. deep in groups in the herbaceous border.

Gladiolus: A good variety of the informal primulinus types, including fluted butterfly and ruffled varieties, is available and as with the larger-flowered types they can be planted in succession until Christmas. The larger-flowered types should be planted 4in. to 5in. deep and 6in. to 8in. apart, but the smaller types may be planted slightly shallower and closer. A dressing of 4 parts of bonedust and 1 part of sulphate of potash should be worked into the soil at planting.

Dipping the bulbs in a solution of formalin or proprietary mercury bulb dip will help clean up any fungous disease which may be present on the bulbs.

Iris unguicularis (stylosa): This fibrous rooted plant will almost have completed its long flowering season and can be divided and replanted. It thrives quite well on relatively poor soils.

Sprekelia: Where there is danger of frosts the bulbs should be lifted annually and the offsets replanted into rich, warm, well-drained soil at this time. Where no frosts are experienced the bulbs may be left undisturbed for several years.

Schizostylis, tritonia, and tigridia: The bulbs can be left undisturbed for 3 to 4 years if planted in clumps 3in. to 4in. deep at this season.

Zephryanthes candida: One of the autumn crocuses which can be planted now.

Roses: Young, healthy growths will be appearing, and where strong winds are common it may be necessary to stake whippy growths temporarily. Where a mass of young shoots has developed some thinning may be done while growths are young. Keep a check for mildew and apply a spray of lime sulphur or dust with flowers of sulphur if it appears. For aphids spray or dust the bushes with lindane.

Water Gardens

Spring is the time for overhauling garden pools. When the surface of pools becomes too crowded with lily leaves the sun is excluded from those plants which produce oxygen which the fish need. The presence of these underwater plants helps to starve out the undesirable algae which discolour the water.

It will generally be necessary to lift the plants, clean the pool, and replant every 3 to 4 years. A mixture of clay loam and cow manure which has been enriched with bonedust will be satisfactory to use for the replanting of water lilies, preferably in tins. The fish can be held in a large drum or barrel of the original water. When the plants have been settled into place for 2 or 3 days the fish can be reintroduced by hand.

When a new pool which has been concreted is to be planted the water should be tested with litmus paper and if necessary a quantity of phosphoric acid added until an acid reaction is given 2 days running. It will then be satisfactory to introduce the plants.

Trees, Shrubs, and Climbers

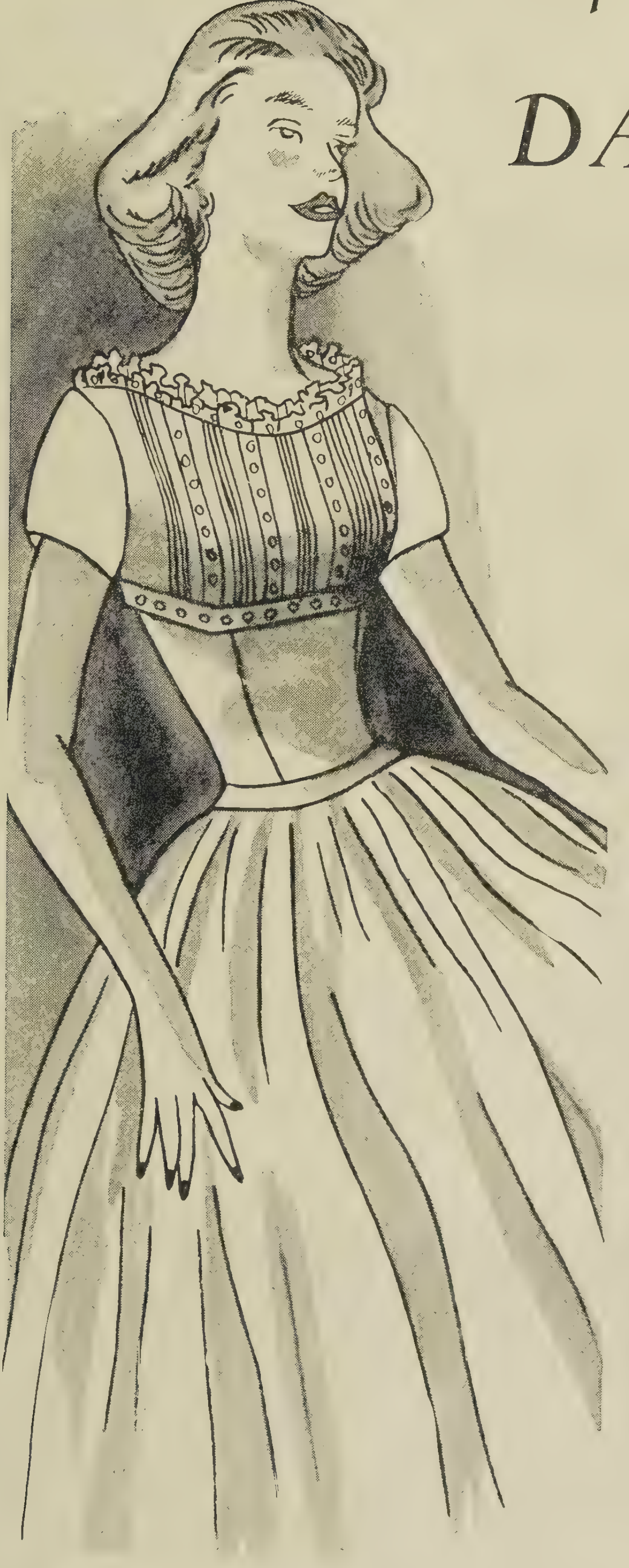
All hedge planting should be completed this month. Sub-tropical plants such as citrus, in the colder areas, and evergreens such as rhododendrons and camellias should now be firmly planted. Where summers are dry a mulch of compost should be spread over the ground beneath the plants. Fertiliser containing 4 parts of blood and bone and 1 part of sulphate of potash by weight can be applied round any permanent plantings of trees and shrubs at 2oz. and 3oz. per square yard. Where natural fertility is low the amount may be increased.

As growth begins again, evergreen hedges should be trimmed.

Climbing plants such as ivy, virginian creeper, ornamental grape vines, and *Clematis jackmani* should be pruned lightly to keep them within bounds. Wistaria side shoots can be pruned back hard to the main stems at this time.

◆

The Importance of DARTS and TUCKS



THE importance of darts and tucks in dressmaking is not always realised. Both can be used as part of a fashion design beside providing a fit and controlling fullness. A perfect fit cannot be obtained by cutting alone, and this article by Mary Hunt, Field Officer in Rural Sociology, Department of Agriculture, Christchurch, shows how darts and tucks must be used if the garment is to fit the figure.

APART from giving the required shape and fullness to a garment darts and tucks can give decorative lines to an otherwise plain garment. Tucks, especially, are used on bodices and blouse fronts, skirts, lingerie, and children's clothes.

Darts are always wider at one part than the other; they may be wide at one end and tapering to a point at the other or wide in the middle and tapering at each end. Tucks are the same width throughout. Darts are generally sewn on the inside of a garment, but tucks may be sewn on either side.

DARTS

Placing Darts

Darts may be placed at the neck, shoulder, underarm, waist, hips, wrist, or elbow. Their size is determined by the position and by the relative difference in body measurements; for instance, between the bust and waist or the shoulder and bust.

On the front of the bodice all darts, no matter where they are placed, should be directed toward the point of the bust.

The size and position of darts are always indicated on commercial patterns, but very often a slight adjustment will improve the fit of a garment. Instead of the extra material being taken up in one large dart it is more satisfactory to make two or more small ones. The more material that is put into a dart the longer the dart will need to be, and if it is not tapered off gradually, a bulge is likely to appear at the narrow end.

Sewing Darts

The pattern markings of darts must be carefully matched, pinned, and basted. It is advisable to fit the garment at

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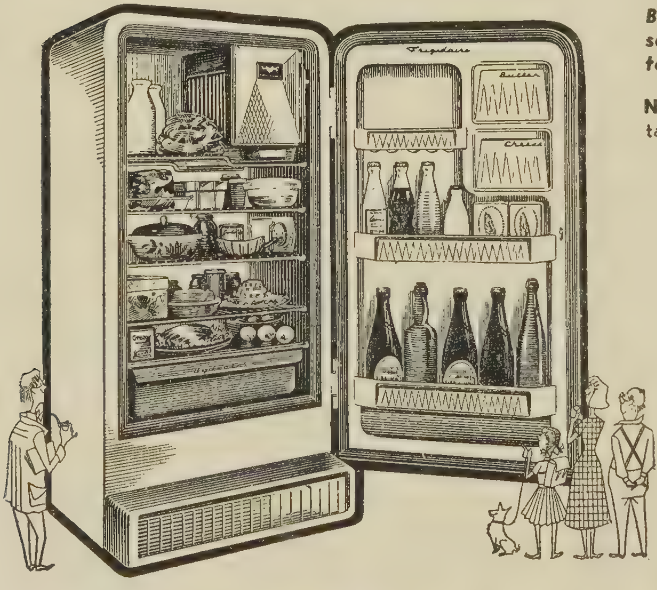

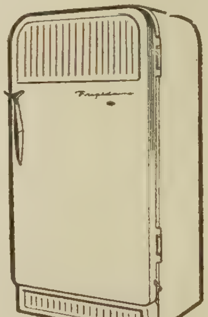

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this stage before stitching the darts. When pinning and stitching, it is important to begin at the widest part and work toward the point.

The stitching should be taken about ½in. beyond the point of the dart, a thread's width from the folded edge (Fig. 1), to prevent a bulge forming at the end. The threads should then be drawn through to the wrong side and tied.

The darts may be stitched again on the right side of the garment to give the appearance of a lap seam.

Underarm Darts

The underarm darts are some of the most commonly used and are generally placed horizontally on the bustline, though they may be placed below the bustline pointing diagonally toward the bust (Fig. 2). These diagonal darts are the best for a large-busted person.

If extra material has to be taken out in the underarm dart, the equivalent amount should be allowed at the waist to give the required length on the side seam.

It is important not to put too much material into one dart in the undearm position, as it should not extend beyond a line level with the widest curve of the armhole. The finished width of this dart should not exceed ⅜in. If more material has to be removed, a second dart should be made.

Shoulder Darts

Shoulder darts may be used as part of the garment design or to give extra fullness over the bust. They can sometimes be used in place of underarm darts. The direction of the grain of the fabric on the shoulder is altered slightly when a dart is made. This lifts the scye line (line level with the bottom of the armhole) and may save the necessity for an underarm dart, though for a full-busted person it may be necessary to have darts in both positions.

More material may be taken out in a shoulder dart than in an underarm dart. As much as 1½in. to 2in. can be taken out with a shoulder dart, but care must be taken to taper the dart evenly to a point so that the garment will fit smoothly over the bust.

When the dart is completed it should be pressed toward the centre of the garment (Fig. 3); for wool, silk, or heavy linens it may be better to slash the dart, press it open, and overcast the raw edges (Fig. 4).

Neckline or Back of Shoulder Darts

Darts may be necessary at the back of the neck or the back of the shoulders to shape the garment correctly. If no allowance is made for the curve of the shoulders, the garment is likely to pull and cause horizontal wrinkles.

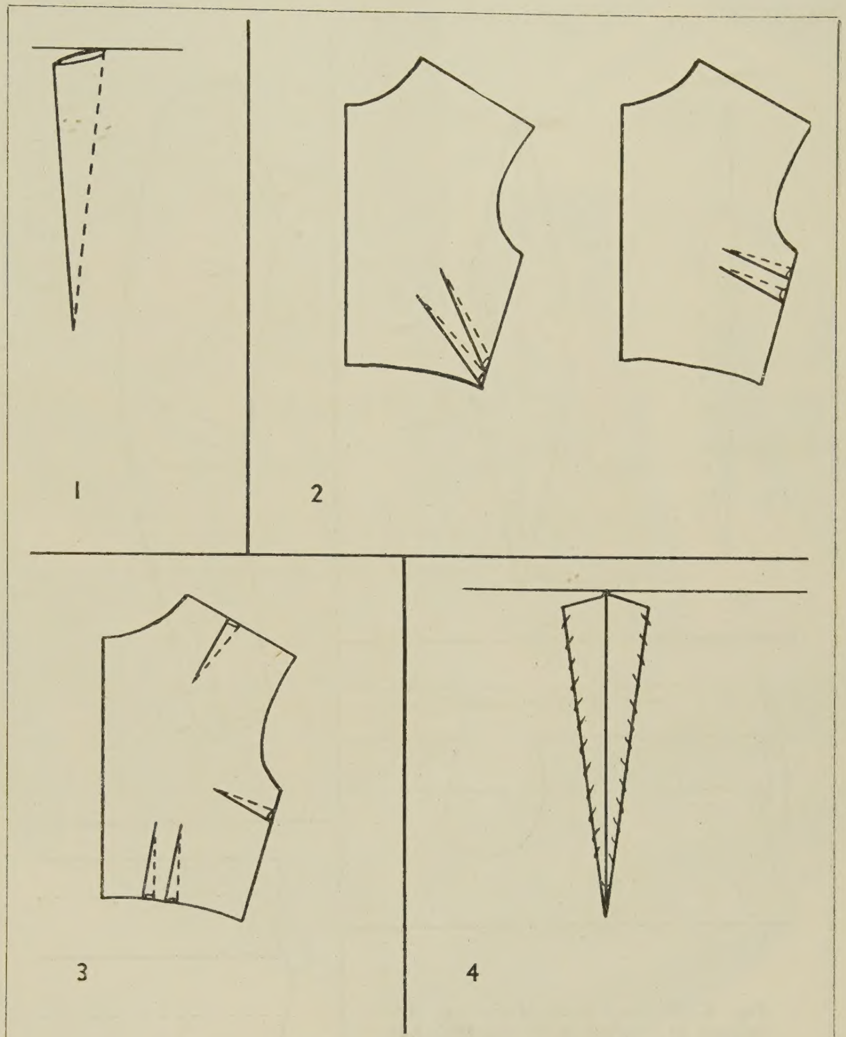


Fig. 1—Stitching should be continued ½in. beyond the point of the dart, a thread's width from the folded edge. Fig. 2—Underarm darts may be placed horizontally on the bustline or below the bustline and pointing diagonally toward the bust. Fig. 3—All finished darts should be pressed downward or toward the centre of the garment, depending on the position. Fig. 4—For wool or heavy fabrics slash the dart, overcast the raw edges, and press it flat.

Whether the darts are placed on the shoulder or on the centre backline or radiate from the neckline will depend on the style of the garment. The width of the darts will depend on the shape of the shoulders and the position of the head and neck. A person with very rounded shoulders will need to take out more in these darts than a person with a straight back. Most commercial patterns allow a certain amount for rounded shoulders, so a person with a very straight back may find it necessary to eliminate any neckline or shoulder darts.

In sheer fabrics the appearance may be improved if the extra fullness is taken up in 3 to 5 small darts, but in heavier fabrics 2 or 3 larger darts are sufficient.

Shoulder and neck darts should be pressed toward the centre of the garment.

Waist Darts

Vertical waist darts are necessary in most bodice patterns to remove excess fullness and to give a snug fit at the waist. The difference between the waist and bust measurements will determine the size of these darts. Those taken in the back of a bodice are generally considerably smaller than the darts in the front.

Care should be taken not to remove too much material in one dart or the

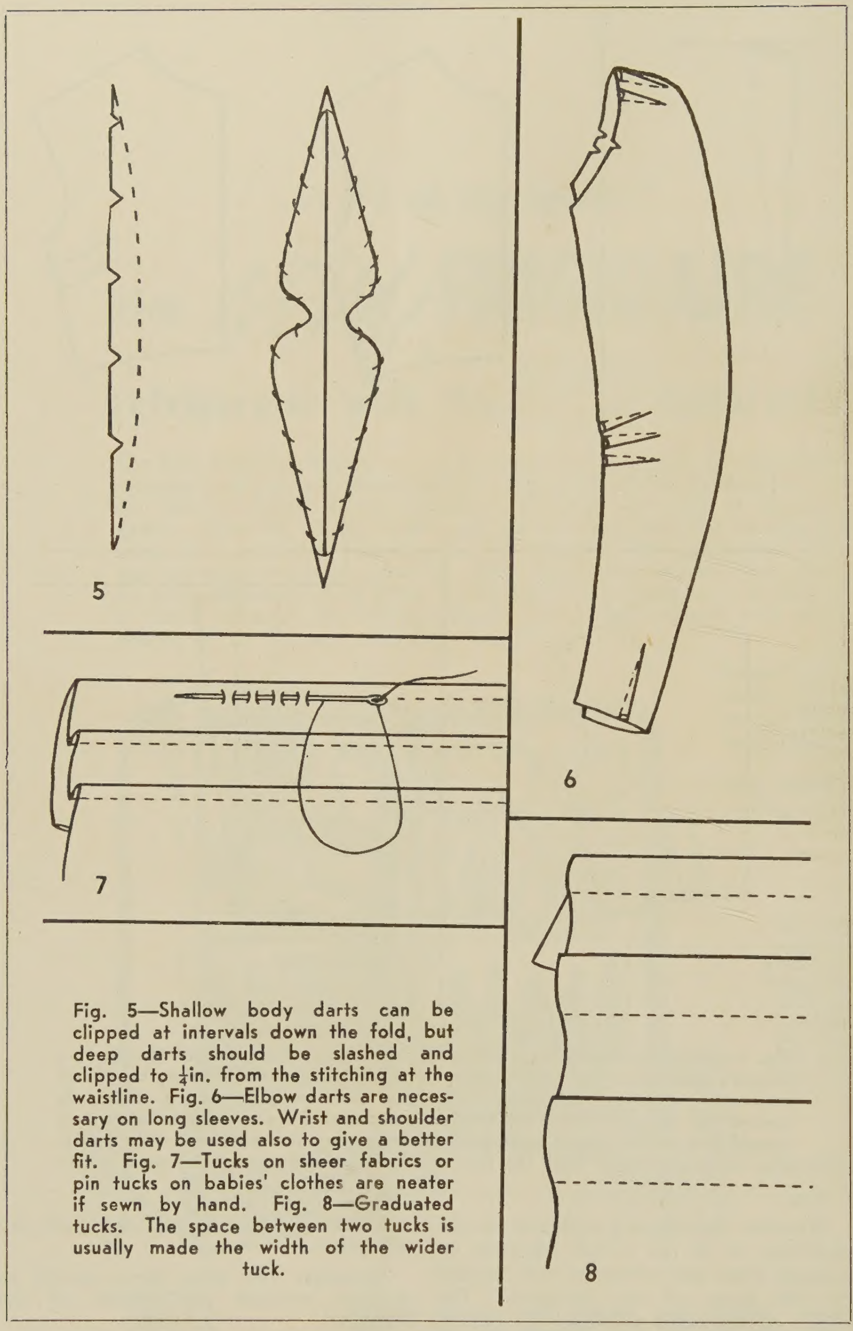


Fig. 5—Shallow body darts can be clipped at intervals down the fold, but deep darts should be slashed and clipped to ¼in. from the stitching at the waistline. Fig. 6—Elbow darts are necessary on long sleeves. Wrist and shoulder darts may be used also to give a better fit. Fig. 7—Tucks on sheer fabrics or pin tucks on babies' clothes are neater if sewn by hand. Fig. 8—Graduated tucks. The space between two tucks is usually made the width of the wider tuck.

dart will require too much length to give a good fit and appearance. A dart 1½in. wide requires about 6in. in length, which is usually too long for a waist dart. The use of two smaller darts or a group of tucks is the best way to remove excess fullness if more than 1in. to 1½in. must be removed. Waist darts should be pressed toward the centre of the garment.

Sometimes, when the bodice and skirt are in one piece body darts are necessary. These are wide in the centre and taper above and below the waist. Shallow darts may be clipped at intervals down the fold, but deep darts must be cut along the fold, and at the waist the edges must be clipped to ¼in. from the stitching line (Fig. 5). The raw edges should then be overcast and the dart pressed open.

Sleeve Darts

For comfort and appearance a long sleeve must have sufficient ease to bend the elbow. This may be done by the use of elbow darts or wrist darts (Fig. 6). For the elbow darts 2 or 3 small darts are made opposite the elbow. These darts should be kept small and not too long, but the size and number depend on the size of the arm. Elbow darts should be pressed downward.

Wrist darts may also be used to adjust fullness over the elbow, though their most important function is to improve the fit of long sleeves at the wrist.

Darts may be used at the top of the sleeve over the shoulder, instead of gathers, to give extra width at the shoulder. They give a more tailored appearance than gathers.

Skirt Darts

Darts at the waistline of a skirt are used in fitted skirts to give fullness over the hips. These darts are generally placed to appear continuous with those in the bodice. However, if they are near the centre-front line, the amount removed should not exceed ½in. Any extra should be removed nearer the side seams, which are at the fullest part of the hips.

For a person who is shorter than average from the waistline to the hipline, several short darts, placed perpendicular to the waistline, are most becoming.

TUCKS

The sewing of tucks can be made much simpler by the use of a tucker attachment, which is provided with most sewing machines. It will make tucks of all sizes from fine, pin tucks to tucks about 1in. wide. Tucks on sheer fabrics or fine, pin tucks on babies' clothes are neater if sewn by hand (Fig. 7).

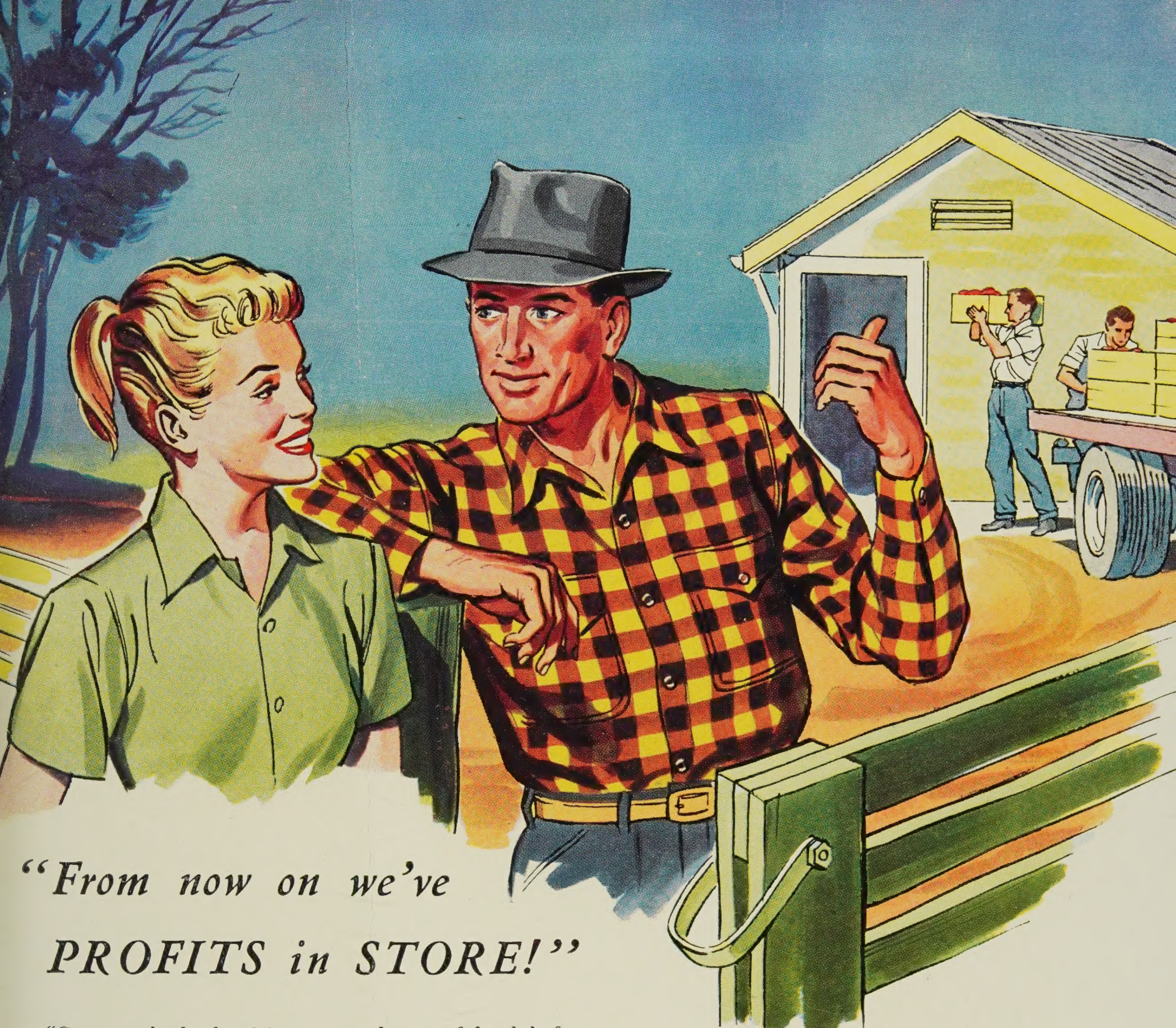
Fullness is sometimes controlled by tucks in such places as the front or back of a blouse, at the tops of sleeves, or round the waistline of a skirt. These tucks generally are sewn on the wrong side of the fabric, while tucks which are used only for decorative purposes are sewn on the right side.

Tucks may be made of even width throughout or they may graduate in size (Fig. 8), with each tuck becoming progressively larger or smaller. For instance, on a skirt or blouse there may be a small tuck at the top graduating to a wide one at the bottom. When the size graduates in this way the space between two tucks is usually made the width of the wider tuck.

Hand-sewn tucks must be spaced and sewn evenly to obtain a neat finish. Before sewing it is as well to crease each tuck on the fabric thread. By use of a fine needle and fine thread, tiny, even, running stitches should be made the required distance from the fold.

Thread ends of machine-stitched tucks should be fastened securely by the threads being pulled through to the wrong side of the fabric and tying.

Printed by Blundell Bros. Ltd. (The Evening Post), Wellington—5530



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